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King and Country

THE most poignant crisis in modern British history is over, and the peoples of Great Britain and the Empire have joined with hardly a dissentient voice in acclaiming the accession to the Throne of King George VI. The painful ordeal through which they have passed might have shaken to their foundations more emotional peoples and less soundly established institutions. The most astonishing thing about the unprecedented series of events connected with King Edward's abdication is that the British conception of constitutional monarchy not only weathered the storm, but emerged from it unweakened and even purified by the trial.

Foreign opinion, being dispassionate, is better worth studying than our own on this point. Other countries looked on with rapt attention while the peoples of the British Commonwealth of Nations were engaged in the solution of an unexampled problem. The universal feeling throughout the world was that the Commonwealth had shown a restraint, a dignity and a soundness of perception which were beyond all praise. The American and French newspapers, which alone among the great nations of the world enjoy a liberty comparable with our own, frankly expressed the view that the almost complete absence of controversy and rancour which marked the final outcome was almost incredible.

The Proprietors, Editor and Publisher of

THE CHEMICAL AGE

wish every reader

A MERRY CHRISTMAS

and a Prosperous New Year

The abdication of Edward VIII within the year of his accession has closed an extraordinarily dramatic chapter of British history. He has made his choice, and the whole Empire has endorsed it. His action has aroused an almost universal feeling of the deepest personal regret. He will live in the memory of millions of his former subjects for the charm and sympathy of a personality which, during his long term as Prince of Wales, seemed to fit him almost ideally for the monarchy.

The key-note of the new situation in which the Empire finds itself was sounded by the Prime Minister at the end of his fateful announcement in the House of Commons in these simple words: "Let us rally behind the new King, stand behind him, help him." George VI has only been on the Throne for a few days, but he is as firmly seated there and already enjoys as loyal support as any of his predecessors. By the testimony of all the national leaders who have spoken, he is sound to the core, unselfish and sympathetic in his personal relations, and completely cognisant of his constitutional duty, with its opportunities of service no less than its limitations. He enjoys the inestimable blessing of a happy home-life, wife and children, and there can be no fear that Queen Elizabeth will not be taken to the hearts of the British peoples as were Queen Mary and Queen Alexandra. No monarch was ever in a better position to claim the goodwill of his people at the outset of his reign. Wherever men meet and talk, there is an overmastering feeling that the events of the last few weeks cannot be allowed to retard even temporarily the onward march of the Empire and the increasing prosperity of its peoples. Edward VIII recognised that the interests of the Throne far transcended those of its temporary occupant, and the corollary is fully accepted that the happiness of the British peoples, linked together by the Throne, is the primary concern of all well-disposed citizens.

How deeply this conception is ingrained in the absence of panic in financial and commercial circles. There were small patches of trouble here and there, but there was no general decline either in the City of London or in the basic industries in the Midlands and the North. Business went on as before without pause, because the British character was shown last week by the complete cool head of the commercial community had entire confidence in the intention of its rulers, both royal and ministerial, to make a right decision. If we had to face an unexampled crisis, it came at the right time. If it had been delayed into the new year there might have been serious business difficulties. As events have shaped themselves, Christmas trade can go forward with the zest of former years, and the announcement that the Coronation date is to be unchanged set the wheels going afresh and with redoubled vigour in the only department of activity which had been temporarily disturbed.

There is a united determination on the part of the controllers of British industry and commerce that no single workman shall suffer any ill effects from a crisis which he did nothing to provoke, and which, by his eminently sane approach to it, he did something to resolve. The King can be depended upon to play his part so far as royal stimulus can foster material prosperity. The whole Empire feels instinctively that George VI and his Consort will prove fully adequate to their task. God save the King.

Notes and Comments

An Empire Palace of Agriculture

TO raise up a great commonwealth of service to take charge of our food interests, Professor H. E. Armstrong would re-create the Crystal Palace as an Empire Palace of Agriculture. In a letter to *The Times* on Monday, Professor Armstrong, who lives near the Palace, urged that the scientific affairs of agriculture should all be transacted there. It should be the nursery in its laboratories for the upbringing of cultured men of original, penetrative outlook, competent to deal with the practical issues of farming, working alternately at farm head and in laboratory. He has in mind the Wellcome Research Laboratories as a model of desirable organisation. Ammonia to-day, he says, may be said to be the foundation stone of agriculture. We are only beginning to understand how to use it properly. Our first national line of defence must eventually be agriculture. We are slowly awakening to the fact, but outspoken defenders of such faith are few at present; we are so carried away by commercialism. The chemistry and physiology of plant and of animal nutrition are of such complexity and delicacy that as yet we have but an elementary understanding of the processes. Interferences, particularly the loss of farmyard manure, have greatly added to the difficulties of farming in recent years. Intensive study is called for in every direction. At present we simply cannot find men with the balanced intuition and cultivated observational power to deal with the problems; our treatment of these is hopelessly narrow and formal.

Catalogues

THE morning post may have brought to you a miscellaneous gathering of " catalogue " literature, solicited and unsolicited. You separate the things you have awaited in response to your own inquiries, and gather the remainder into a separate pile for perusal at leisure. The bulky catalogues and elaborately printed brochures are there, mingled with single sheet leaflets of no outstanding appearance. But the stories which they have to tell you may be in inverse proportion to their aristocratic bearing. Not one single item should be ignored; the time devoted to each must be gauged by you as a proportion of the time which you have to spare. If you are wise you will already have learned that you can never be *too* busy to devote some of your time to this task at regular intervals—if not daily, at least once a week. If you *are* really too busy, one day you will realise that you have never been so wise as you thought you were. One day you will make a discovery which might have been made many months earlier if you had been a little less in a hurry to ignore the cosmopolitan catalogue literature. It may be a discovery which will overcome some difficulty; it may be one which will cheapen your cost of production, saving you merely fourpence per hundredweight of product, but soon accumulating to banker's pounds, had you adopted the device earlier in your manufacturing activities. Good stories and poor stories, each with an idea to put forward, are found in the catalogue literature which is received almost continuously throughout the year. Study that literature and it will ultimately repay you for the time devoted to the task. Write for the literature that you see advertised in those cases where it should have some bearing upon your activities. File it for future reference, if you consider it may be usefully referred to at some future date; a little occasional weeding may be done in a slack period of the year to avoid an accumulation which is out of proportion to its usefulness.

Chemical Trade Statistics

THE adverse trend of overseas chemical trade to which we have referred from time to time during the year must not be given an exaggerated importance, for there are many circumstances which point to a more prosperous state in the chemical industry than the export figures would imply. If the British chemical manufacturer is not gaining ground in the overseas market he is more than holding his own at home, and the fact that imports are growing points to a general rise in the consumption of chemical products —in itself a sign of industrial prosperity in the wider sense. We must not, however, ignore the gradual narrowing of the margin between the volume of chemicals sold abroad and those brought into the country, for the industry cannot afford a serious shrinkage of exports or a further large jump in the import of such chemicals as could well, if not better, be made at home. Chemical exports last month were £128,895 lower than a year ago, bringing the total decrease for the eleven months to £361,483, while imports rose by £18,015 for the month, making a total increase of £836,952 for the eleven months. The excess of exports over imports has thus dropped from £8,958,255 in the first eleven months of 1935 to £7,759,865 this year. We are now importing considerably more than half as many chemicals as we are exporting, and the positon is one that must be carefully examined in the new year.

Human Research

MUCH is heard nowadays of chemical and physical research in industry, but we are prompted by Sir Kenneth Lee's recent address to the Bradford Textile Society to ponder whether adequate attention is given to human research. He is of opinion that when workers leave their jobs for any reasons other than personal domestic ones research ought to be made to find the reason. Often alterations in working conditions can remedy any discontent, and a factory manager should investigate each case of a worker leaving his employ. As confirmed believers in the five-day week, which has been in operation in the offices of THE CHEMICAL AGE for many years, we are interested to learn of an experiment Sir Kenneth Lee's firm has made in that connection. The five-day week was established in two mills, the working week being reduced from 48 to 45 hours. The result was that a loss of production of approximately 6 per cent. was discovered, equal to the difference in the hours worked. Production efficiency research yields many interesting facts; for instance, it is said that a works manager can always tell when a girl employed on piece work becomes engaged to be married, for her output and wages suddenly increase and remain high as long as she is preparing for her wedding.

Chemical Engineering in the Leather Industry

A Wide Field Waiting Investigation

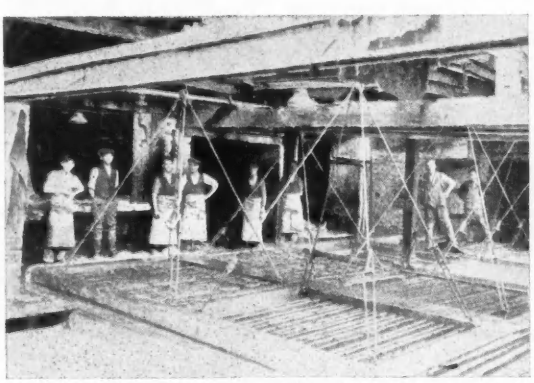
THE most striking features of the work of a tannery are the mechanical operations, such as the handling, scraping, splitting, shaving, etc., of the skins, said Mr. C. H. Spiers, Ph.D., D.I.C., in a paper on "Chemical Engineering in the Leather Industry," read at a meeting of the Institution of Chemical Engineers held in the Rooms of the Chemical Society, London, on November 18, Dr. W. Cullen (vice-president) being in the chair. The important chemical reactions, he continued, tend to remain in the background because they are slow, occur at comparatively low temperatures, and need no impressive plant. This contrast has tended, and still tends, to hinder the recognition of leather manufacture as a chemical industry.

Although there are chemists and engineers in the industry, the value of the chemical engineer has not yet been appreciated. Generally, the type of expert technical knowledge available in the tannery is that falling within the province of the chemist, who has been called upon to undertake work for which he has not been trained.

Major Problems

Most of the more characteristic leather manufacturing processes occur in water solutions and involve the passage of chemicals from the solution into the skin and vice versa. The chemical must move (1) through the body of the liquor to the surface of the skin; (2) from the surface of the skin through the fine, interfibrilliary spaces to the surfaces of the fibrils, which are swollen with water; and (3) between the micelles of the fibrils and the polypeptide chains of the micelles.

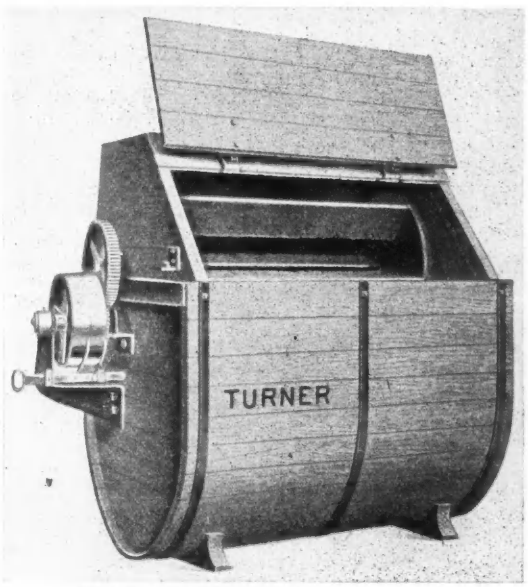
The whole movement involves diffusion phenomena, complicated by the simultaneous occurrence of chemical combination and adsorption. At the various surfaces one can suppose that stationary films exist, whose properties determine the penetration of the chemical through them. One of the chief problems of the tanner is to design plant for getting the chemicals as quickly as possible to the seat of the reaction, the interior of the fibrils. A second similar, but simpler,



Acceleration of Deliming. The hides are suspended from frames which are moved vertically up and down.

problem is the elimination of unused chemicals and by-products from the skins by washing and a third problem is drying.

The fundamental pieces of plant for the tanner are the vessels in which he brings the skins into contact with chemicals dissolved or suspended in water and ultimately washes them Ordinarily, there is no need for elevated temperatures or pressures above atmospheric. A convenient size is about 1,000 gal. The earliest form of vessel, still used to-day, was a wooden tub or pit, sunk into the ground. The skins were laid flat in the pits containing the liquor. Penetration occurred by diffusion and was necessarily slow. Sometimes to accelerate the action, the goods were frequently "hauled and set," that is, removed from the liquors one by one and piled up. After plunging up and perhaps strengthening the liquors, the goods were re-immersed. The piling squeezed exhausted liquor out of the skins, which, therefore, fed better when put back. To maintain the concentration of the liquor in contact with the skins, a reservoir of the chemical used might be introduced between the skins, for example, pieces



Paddle for bating, tanning, dyeing, etc.

of ground oak bark were placed between the skins as they were replaced in the tan liquor.

Simple diffusion processes are usually too slow. A notable exception is afforded by the painting process for loosening the hair or wool of sheep, coat and calf skins. Such skins are painted on the flesh side with a strong solution of sodium sulphide, thickened with lime. Within a few hours the sulphide has diffused through to the hair roots and disintegrated them sufficiently for the hair or wool to be pulled off gently. An ingenious machine has been devised for applying the chemical to the skin.

Generally, however, diffusion processes are too slow, but they can be accelerated by (1) adjustment of the composition of the liquors; (2) increase of concentration; (3) rise of temperature; (4) electrophoresis or supplemented by mechanical working, namely: (*a*) kneading and squeezing; (*b*) agitation; (*c*) use of vacuum and/or pressure. Most frequently kneading squeezing and agitation are adopted for quickening the processes and the tanner utilises pits fitted with agitators and special vessels, with paddles and drums.

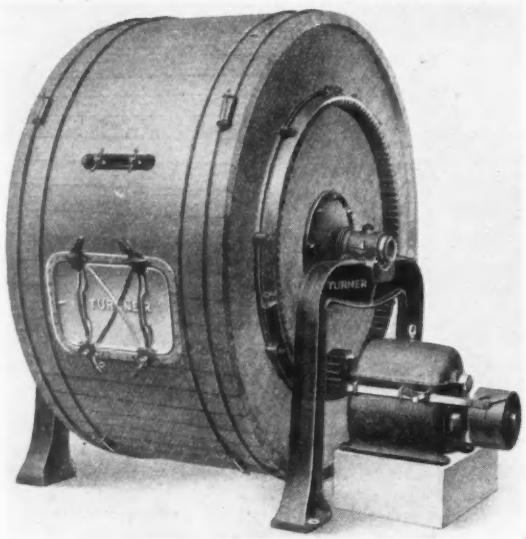
Kneeding and Squeezing Methods

In making chamois leather, the tanning agent (cod oil) is forced into the wet skins by stocking. In the Wilson tanning machine the hides are alternately removed from the liquor and squeezed against each other and reintroduced into the liquor so that they can suck up more of it.

Pits are almost universally used for some stages of the treatment of hides and agitation methods have been applied to them in two ways. Either the goods are moved or the liquors are circulated. Pit agitation methods necessitate the labour of individually suspending the hides in a vertical plane in the pits and the proper circulation of the liquors is

difficult. There is a tendency to abandon pits wherever possible in favour of drums and paddles.

The paddle is a somewhat primitive device much used for skins. It consists of a long semi-cylindrical wooden vessel with a box-shaped part above it. Above it is fitted a wooden paddle wheel usually with four vanes. This may be over the axis of the machine or towards the back. The blades dip one or two inches into the liquor and the speed of rotation is from 5 to 20 revs. per minute. The paddle may be fitted with a cock for blowing in live steam and a cover for conserving



Drum for various tanning operations.

heat. The density of the water swollen collagen fibres is below 1.4 and the gentle circulation caused by the paddle wheel keeps the skins in motion. As with agitation in pits, the chief effect of the paddle is to maintain the concentration of the liquors at the skin surface and mechanical action on the skin is secondary.

Accelerating the Processes

Drums are the chief instrument used by the tanner for accelerating processes. They are constructed of wood and have a variety of shapes, namely, cylindrical, polygonal, cubical, etc. Most commonly they are cylindrical. The relation of the diameter to the width depends on the proposed use. Usually the diameter is greater than the width. A standard size is 8 ft. dia. by 4 ft. wide. When this is filled to a depth of 2 ft. it holds about 250 gal. It will take a load of about 20 dozen calf skins, that is about 2,000 lb. of wet skins or 500 lb. of dry skin matter. The power needed is between 2 and 7 h.p., depending on the circumstances.

More power is needed with a drum fitted with pegs than with shelves, because the pegs carry the skins out of the liquor more efficiently. When the skins are slippery, as they are before tanning, less power is needed than when they become rougher, as in the course of tanning. Thus it may need 3 h.p. to drive a drum while the skins are slippery and 15 to 18 h.p. when they are tanned.

Drums in the leather industry are still constructed of wood, which is hardly an ideal constructional material. It is difficult to clean. Internal friction is great. Bearings get out of alignment, and it does not lend itself to watertight construction. The continued use of wood is perhaps a survival from the days when resistant metals and other materials were not available. The material used must stand a wide rnge of *p*H values. Since vegetable tannins readily give blue and green compounds with iron, no iron may be exposed inside a drum, and heads of bolts must be brass covered.

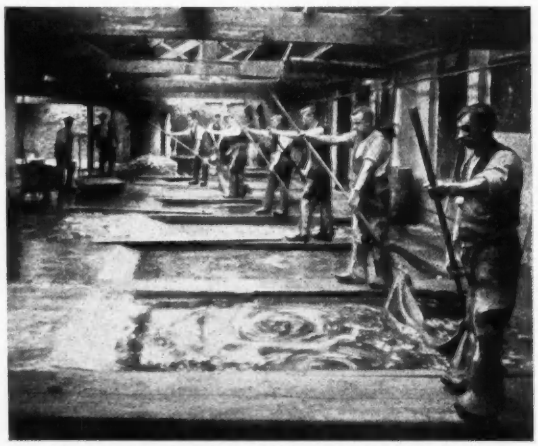
Little serious work seems to have been done upon the fundamental features of drum design, namely, proportions, shelves, speeds, load, float, etc., and these features seem to be often matters of opinion.

At various stages skins and hides have to be washed more or less thoroughly. The methods used are very crude and are usually carried out without regard to the most economical utilisation of water. One mode of washing is to treat the skins in a paddle. Water is run in, maybe at the top at the back, and is allowed to overflow on to the floor. Some may improve matters by introducing the water at the bottom. Another method is to use a drum fitted with a perforated door instead of a solid one. The drum is revolved and water run in through the hollow axle. Part of the water introduced during the period of revolution is discharged on to the floor when the door reaches its lowest point. Paddle washing depends largely on diffusion for the elimination of the chemical. In drum washing the solution is to some extent forced out of the interstices mechanically and replaced by water.

Agitation is designed to assist the maintenance of the concentration of the chemical at the surfaces of the solid reactant. With a skin there are several surfaces. There is the surface of the skin itself, at which it is comparatively simple to maintain the concentration, for example, by simple agitation of the liquors themselves. This is probably insufficient, for it is necessary to accelerate the entry of the chemicals into the interfibrilliary spaces. For this something more than mere agitation of the liquors is necessary and it is customary to move the skins themselves, producing flexing, squeezing and kneading. To promote the entry of the chemicals into the fibrils is the hardest and it is doubtful whether any method for achieving this has been devised. Washing involves the reverse action.

Shifting Liquors

It is simpler to move liquors than hides and skins. Nevertheless, in most cases the goods are moved. The reasons are (1) different processes need different types of vessels; (2) the



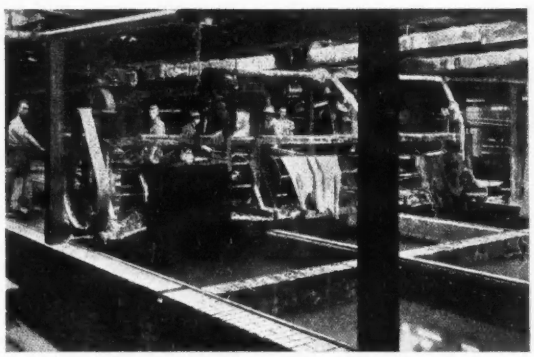
Lime yard, showing shifting of hides by hand.

skins must be mechanically treated between processes to press out solutions held in the capillaries and remove parts not needed in the leather, for example, the flesh and epidermal system; and (3) the range of *p*H of the processes is wide.

The chief example of the extensive movement of liquors is afforded by the vegetable tannage of sole leather. Here large volumes of tan liquor must be daily moved by centrifugal or rotary pumps. Liquors were formerly distributed from the pumps by wooden conduits, but now armoured rubber hose is employed. Waste liquors from drums and paddles are often run on to the floor.

Wood is the material most used for constructional purposes in pits, paddles, drums, pipes, leaches, floors, etc. The kinds used include pitch pine and red deal. A striking feature of the leather industry is that vessels are seldom made of metals except in special cases as, for example, in vacuum tanning,

where strength and air tightness are essential. One reason is no doubt the absence of a sufficiently resistant metal. Corrosion is troublesome, not merely because it destroys the plant, but also because stains arise on the leather from the dissolved metal. This is especially the case with vegetable tanning. The objection to iron has already been mentioned. Copper is more resistant to tannins than iron and is hence much used for tools, heating coils, etc., for autoclaves and evaporators in extract manufacture, but recent work has



Reeling hides from pit to pit in the lime yard by power-driven reels.

shown that copper compounds can produce greenish stains in vegetable tanning, though the discolorations are not so intense as with iron. In recent times attention has been directed to the use of a variety of non-ferrous alloys, stainless and staybrite steels.

At various stages water has to be eliminated more or less completely from the skins. Some capillary water is removed mechanically by "setting out" machines, wringers, presses or centrifuges. In setting out machines, the water is forced out by working a cylinder with dull helical blades across the skin under pressure. The residual water is evaporated. As far as general principles are concerned the drying of leather must resemble the drying of other fibrous materials.

Leaching the Tanning Materials

The ground materials containing the tannin have to be leached to provide water infusions of the vegetable tanning. The process is carried out either by the tanner or by manufacturers of such extracts. Tannins are somewhat sensitive to air and heat, and some are not easily extracted. They are accompanied by considerable amounts of non-tannins. The aim is (1) to obtain the most concentrated liquor possible; (2) to extract the maximum amount of tannin and the minimum amount of non-tannin; (3) to avoid harmful chemical changes. To achieve the most concentrated liquor possible, a counter current principle is adopted and to attain the second and third objects the temperature conditions are carefully adjusted.

Batteries of six or more extractors are employed. One of the simplest leaching plants is the press leach system, common in tanneries. The extractors are rectangular wooden vessels with false bottoms. The bottom of the first extractor connects up with the top of the second and so on; the bottom of the last extractor connects with the top of the first. Extractor No. I contains the most exhausted material and the weakest liquor, and extractor No. VI the strongest liquor and freshest material. The strong liquor from No. VI is run out for use or concentration. The weakest liquor in No. I is now pumped on to the liquor in No. II, thereby forcing the liquor in No. II into No. III, etc. Extractor No. I is now emptied and filled with fresh material. Hot water is added to No. II whereby all liquors move forward once more and the whole six extractors are full again. After a suitable interval the process is repeated.

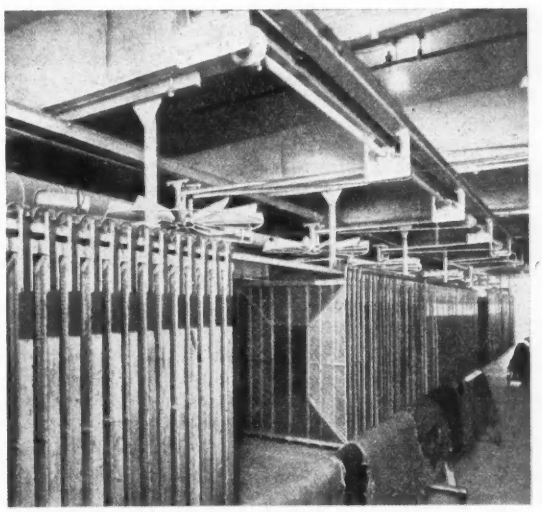
The disadvantages of this simple type of plant are (1) the extractors are open; (2) maintenance of correct temperature is impossible; (3) the downward circulation of the liquors causes blockage; (4) it is difficult to press the liquors through the battery; (5) the system of pressing liquors is inefficient because the liquors mingle; (6) emptying is laborious.

Dr. DOROTHY LLOYD said it was not easy to introduce chemical engineering into the leather industry partly because it was such an old industry and the people engaged in it had got into certain habits, and partly because of the considerable difficulty with iron. There was a great difficulty in introducing iron in its corrodible form into the side of the trade where vegetable tanning was done. One of the objects of the propaganda of the Leather Research Association among tanners was to urge them to keep iron from trickling into the tank liquors. The request was always being made for a non-corrodible paint and there was a very great difficulty in this matter.

The Problem of By-Products

Mr. F. SIMON said that one problem in the leather industry to-day was that a great many by-products could not be used as they should be. After the raw skins came to the tanner, large pieces were cut away and they could be used for many purposes but were not. The chemical engineer would find a great deal to do in the leather industry in this connection. Another problem which the chemical engineer might solve was the better utilisation of the hair.

Dr. E. W. MERRY said one matter which was worthy of consideration was the difficulty encountered by the tanner in introducing mechanical aids. He had to keep in mind the volume he was using compared with the amount of goods being put through the liquor because this affected the actual tanning process and the various other processes involved. For example, in the old days a pit of 1,000 gal. might contain 50 hides. Now the tendency was to change over to the



Drying room for dyed vegetable tanned skins to be dried in strained condition. (Sutcliffe Ventilating and Drying Co., Ltd.)

agitation method and that meant the hides were suspended and the number in a pit was reduced. That at once disturbed the volume of liquor to the quantity of goods, and it was a feature of great importance which the chemical engineer must bear in mind. A point the author had not touched upon was the treatment of effluents. The treatment of tannery effluent was a difficult and complicated problem.

Mr. G. JESSOP CUTBUSH, referring to the life of wooden vessels, said he had known them to be in service for 30 years and then it was impossible to push a penknife more than $\frac{1}{4}$ in. into the wood. In the case of wood lime pits there seemed to be the formation of carbonate on the surface which took on quite a rock-like formation and seemed to act as a preservative.

Mr. H. W. CREMER said the chemical engineer had already entered the leather industry, especially with regard to leach-

ing, a matter which the author had dealt with in a somewhat cursory manner. The chemical engineer was ready and waiting to make use of the background lying behind the principles of leaching in a rational way, and he felt that some reference might have been made in the paper to what the chemical engineer had already done in that respect.

Dr. H. D. H. DRANE emphasised the economic generation and efficient use of power, whether in the form of electrical power for mechanical drives at a later date, or process steam. During his experience of tanneries both in this country and abroad, he had seen gross waste of power. In many cases tanneries had not been adequately designed and that was another sphere for the chemical engineer, to apply his knowledge to the proper design and co-ordination of running a tannery at the stage when it was on the drawing board. A further point was whether in regard to drying skins, tanners had had the co-operation of the people who were dealing with such matters as timber drying, because the kiln drying of timber seemed to be an entirely analogous problem to the drying of leather.

The History of Leaching

Mr. M. B. DONALD, speaking with regard to leaching, said that looking through the literature on this subject he had found an English Patent of about 1650 for leaching using wood bark or tannin containing materials and water and evaporating the resulting solution. In a further search on this question of tannin extraction he had come across the statement that it was only in the last 50 years that extracts had been used instead of the bark itself. He understood that the original practice was to use the bark for tanning instead of the extract. It seemed to him rather a large gap between 1650 and 1850, however, so that there must have been something wrong in the leaching for that not to be adopted.

Mr. F. J. BAILEY suggested that instead of tanners fiddling about with a lot of triangular pieces of skin they should trim the edges and start with reasonably rectangular pieces of skin, which could be graded in a set of sizes at the initial stages of the process, stretched on frames at the beginning and put into a condition in which they could be handled even by the chemical engineer. That would facilitate the problem of getting more skins in the same pit, and at the same time leave sufficient space for the liquid to circulate fairly freely between the skins.

The CHAIRMAN called attention to the statement in the paper that "ordinarily there is no need for elevated temperatures or pressure above atmospheric," and to the remark that pressure and vacuum were used to enable the impregnation of the skins to take place more rapidly, and added that to show the empirical nature of the leather industry to-day the author frequently used a very non-committal remark. A point of importance in the leather industry, and also in many other industries which involved the handling of colloids, was unused chemicals, *i.e.*, the residual chemicals left in the leather itself. He imagined that must be a difficult problem for the reasons which the author had given, but in some of the other colloidal industries—and he had particularly in mind, explosives—there were small quantities of solvents liable to oxidation during the course of time, probably under the influence of light and heat, and it might be known that they had resulted in tremendous accidents or explosions both on board ship and on land.

Mr. Spiers Replies

Mr. SPIERS, replying to the discussion, said he had perhaps over-exaggerated the position of temperature control and the carelessness of the tanner, but he had stated that more attention was being paid to the subject and he believed the tanner was realising the importance of it. He did not deal with effluents because Dr. Dorothy Lloyd had dealt with that matter before the Institution of Chemical Engineers a few years ago, and he imagined it was not worth talking about again. Reference had been made to the scope in the leather industry for the chemical industry and one of the points he had tried to emphasise was the need for chemical engineers in the design and operation of tanneries. He had been concerned with many tanneries both at home and abroad, and had always been impressed with the poor design of them and the generally poor maintenance of the plant. There was gross waste in many directions in some tanneries, and the points mentioned during the discussion were very much in his mind. Part of the trouble, at any rate, was that the leather trade had not been getting the right type of technical help, and an important source of technical help which the leather trade required was the help of the chemist and the chemical engineer. The ordinary chemist was not trained to deal with such questions as the lay-out and maintenance of plant in the leather industry and to decide such questions as the materials to be used, the best power system and the multitudinous problems which arose in the industry. These were problems for the chemical engineer and he hoped the Institution of Chemical Engineers would endeavour to make the leather trade realise the sort of help its members could give.

The question of leaching had been mentioned, but there again no doubt a great deal had been done by people outside the industry, whereas he had been judging the situation from what he had found in the leather industry and what was being talked about in the industry. As a result he had the impression that leaching was not considered very systematically by the ordinary leather trades chemist, and that was why he had drawn attention to it in the manner he had. At the same time, he had no doubt that much valuable work had been done by others.

Grinding and Evaporation

Grinding had not been dealt with in the paper because he did not regard it as specially a typical tanner's problem, but, of course, the tanner had to adopt proper means for doing this and to use special machines. In the same way he had not dealt with the evaporation of extracts because he felt it was not a problem peculiar to the leather trade. Mr. Donald, who had mentioned these matters, had spoken of the gap between 1650 and 1850, but if he knew the leather trade he would be surprised the gap was so short.

The cost of the raw skin was a huge item in the cost of the leather and therefore the manufacturer had to be extremely careful and conservative not to risk any change in his methods of operation until he was absolutely certain of what he was doing. A certain amount of attention had been given to grinding the materials but he did not know if it had been tackled systematically and scientifically. In the beet sugar industry the people had found out the exact way to slice the beet. There was an important difference between slicing the beet across the grain or parallel to the grain and whether there were thin slices or thick slices, and according to the method adopted there was a difference in the efficiency of extraction. The tanners had tackled the problem from the point of view of the maximum amount of tannage and not so much from the point of view of diminution of impurities of the non-tannins.

The Problem of Drying

He had been purposely vague about drying for the reason that it was a curious problem. There was considerable room for doubt as the material was so variable. The quality of leather was very variable and whereas a certain system of drying was good for one quality of leather it would not do for another. Most of the writers on the subject had been concerned with external drying conditions, whereas he had mentioned internal drying conditions, *i.e.*, the movement of the water in the leather during the drying.

Generally speaking, elevated temperatures and pressures were not used because the plant was too expensive. The problem of residual chemicals was a difficult one, and it must be admitted that in the leather trade the methods of washing were distinctly crude, but often one did not wish to wash leather to such a high degree as it was necessary to wash explosives.

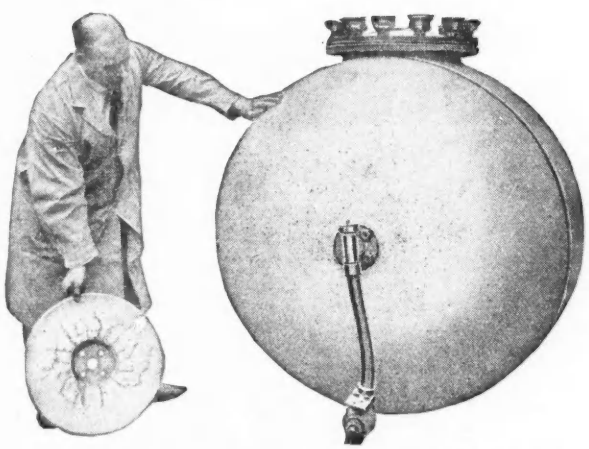
Welding Alloys : Methods in the Chemical Industry

By C. W. BRETT, M.Inst.W. (Managing Director of Barimar, Ltd.)

THERE is probably no other industry in which welding plays such an important part, both in matters of construction and repair, as that which is occupied in the production of chemicals.

A wide variety of containers must be constructed in special alloys in order to resist the action of certain chemicals. Rivetting as a means of construction is often-times not feasible, owing to the need for presenting clean surfaces without ledges. This point is of equal importance in connection with maintenance and repair work, for by utilising fusive methods butt jointing can be employed and the result is a perfectly clean surface both inside and out.

There is no need to catalogue the metals which can be welded not only with complete assurance of success, but also carrying a guarantee; in particular, however, stainless steel, copper, bronze, duralumin, elektron aluminium and its wide range of alloys may be mentioned, in addition to those more commonly known. In cases of corrosion the most usual method of repair is to cut out the defective portion and weld in new material of exactly the same specification, a remark which also applies to the weld metal.



This aluminium vessel was badly corroded and cracked where the outlet pipe fitted. This defective piece was cut out—it is shown at the side—and a new piece made and welded in place, making the vessel as good as a new one. (Repaired in the Barimar Welding Works.)

So valuable has welding proved to the chemical industry that alterations have been made in the constituents of various alloys in order to facilitate welding processes. Other alloys are specially treated for the same purpose. Outstanding examples of the foregoing is the increased use of de-oxidised copper and stainless steels in which a certain proportion of tunsten and titanium has been introduced. It was the welding engineer, in the course of his experiments in the production of welding material, who was one of the first to recognise the great value of titanium for alloying purposes.

Special reference should be made to the large number of jacketed and heated vessels which can usually be constructed by fusive methods more easily than by any other process. A further point of importance is the individuality of chemical producing plant and by the same means special equipment can be produced much more cheaply than by methods which call for pattern making and the production of single castings.

It has frequently been found during the course of repair that alterations in design are practicable; moreover any weaknesses which may have developed can be corrected by adding additional metal at vital points. Another important application of welding is in the making of joints in pipe lines which must resist high pressures, for a welded connection is much more trustworthy than any form of screwed and socketted joint.

So far as aluminium castings are concerned it is of interest to observe that these are rarely made of pure aluminium and almost invariably an alloy is used. Fusive work in connection with this material calls for the highest degree of skill, but in common with all first class welding work, the surfaces of a specialist are of paramount importance if successful results are to be obtained, and this is a fact which is widely recognised throughout the chemical industry.

In concluding this article, a difficult repair job comes to my mind. This was a copper vessel, the lower portion of which was badly cracked and corroded; the defective place was cut out, and a new piece was welded in. This repair was a complete success and saved the owners a large sum of money.

Trade Mark Dispute

Parties Arrive at a Settlement

IN the Chancery Division on December 10, Mr. Justice Crossman concluded the hearing of an action by Cupsal, Ltd., of Blackburn, against Mr. J. H. Chapman, trading under the name of Reuglo, of Thornleys Road, Bristol, for an injunction to restrain infringement of trade mark and passing off, and an injunction to restrain defendant from carrying on business under the trade name of Reuglo.

Mr. Burrell, for plaintiffs, said he had no evidence of actual confusion in regard to the names. The plaintiffs were manufacturing chemists, founded in 1898. In October, 1926, they were registered as a private company with a capital of £25,000, of which £20,000 had been issued. Their business was to supply retail chemists with the products they manufactured. In order to identify their products they used certain trade marks. The one in question in this case was the word "Rayglo," which was their "house mark" and indicated a series of pharmaceutical preparations. Ever since 1928 the word Rayglo had been associated with a service mark—a sun and its rays. The word was used sometimes alone and sometimes with the device of the sun and its rays. Plaintiffs' case was that the word Rayglo was distinctive of plaintiffs' goods to the exclusion of all other manufacturers dealing in this class of property. Rayglo and the device of the sun and rays indicated plaintiff's goods, which included nerve foods and essences. The complaint of the paintiffs was that the defendant used the word on a label similar to plaintiffs' device, and that this was likely to lead to confusion, as well as being an infringement of plaintiffs' registered trade mark.

The defendants by their defence denied the infringement or passing off and said they only sold "fruit products" and not medicinal products. Their business was in a different type of goods to the plaintiffs and therefore there could be no confusion.

After a hearing lasting several days, the parties arrived at a settlement. The defendants submitted to an injunction to restrain infringement of plaintiffs' trade mark and for carrying on business under the name of Reuglo, and gave an undertaking to deliver up all the remaining labels in their possession and to an inquiry as to damages, and further to pay an agreed sum for costs.

Mr. Burrell said the plaintiffs made no allegations whatever against the good faith of the defendants.

His lordship said that appeared to be quite clear. It appeared to him that there were no grounds for any such suggestion. It was only by misfortune that the defendants hit on the word which was complained of.

Transmutations in the Chemical Laboratory

Sixth Liversidge Lecture of the Chemical Society

CHEMISTS of to-day are more disposed to acknowledge the merits of the alchemists than were their confrères of the nineteenth century; this period was in fact the only interval of neglect during the whole seventeen hundred years or so of European alchemy's ascendency, said Professor F. A. Paneth, in delivering the sixth Liversidge Lecture to the Chemical Society, in London on December 10. It was Liebig who declared that chemistry, with its marvellous powers of changing black coal into brilliant colours and efficient remedies, had taken the place of the philosopher's stone.

The revival of the idea of alchemy belongs essentially to this century. Two dates are of special importance; in 1896 H. Becquerel detected the invisible rays of uranium, and in 1919 Rutherford and Chadwick observed the emission of a new type of ray when nitrogen was bombarded with alpha-rays. The first experiment led to the discovery of the spontaneous transmutation of the radio-active substances; the second was the first example of an artificial transmutation. In the beginning, work on both lines was based on physical methods of detection with photographic plate, fluorescent screen, electrometer or Wilson chamber. In the study of the natural radio-elements the assistance of chemists was of decisive importance from the very start; it was longer before they could offer any help in the investigation of artificial transmutation. In both cases they applied first radio-chemical and later purely chemical methods to the study of the changing elements.

Deliberate Transmutations

Under radio-chemistry we understand the application of the methods of chemistry to invisible substances while the effect of the chemical operations is controlled by some sort of apparatus for the measurement of radioactive rays. These methods led to the discovery that radioactive elements are formed and disappear in our laboratories, and even the chemical properties of invisible substances could be investigated. In 1903 the fact of elementary transformation was confirmed by classical chemical methods, when Ramsay and Soddy showed spectroscopically that radium salts evolved helium. Soon after the discovery of the spontaneous disintegration of the radio-elements Ramsay tried to use their rays as a means of artificial transmutation. We know nowadays that the successes claimed by him were not genuine. The micro-chemical methods of those days were not sufficiently refined to detect the minute quantities of transmuted matter which are produced under the impact of rays. For many years deliberate transmutation could only be detected by physical apparatus, but in 1934 the discovery of artificial radio-elements by M. and Mme. Curie permitted the application of radio-chemical methods. The collaboration of chemists in these researches was very fruitful, leading amongst others, to the discovery of elements higher in the periodic system than uranium.

The purely chemical confirmation of artificial transmutation is more difficult than in the field of natural radio-elements as the quantities of newly formed matter are infinitely smaller. If, however, boron is irradiated with a strong source of neutrons enough helium can be produced for a spectroscopic identification and manometric measurement, as shown by Professor Paneth and his co-workers in the Imperial College. In such an experiment we are fairly near to the old alchemistic aim because the whole transmutation can be carried out in the chemical laboratory. It is sufficient to mix a radium salt with finely powdered beryllium in order to obtain the "philosopher's stone" of the alchemists. This modern form of the stone can transmute not only boron but many other elements quite as well.

It is to be expected that in future the chemist's help in the study of transmutation will be mainly in two fields. On the one hand, he will collaborate with the physicist in the investigation of artificial transmutation. Here mostly radio-chemical and not purely chemical methods will have to be applied, and the researches will not only be theoretically important but a knowledge of the chemical character of artificially produced elements will be very valuable also for obtaining a variety of radioactive indicators for many practical applications in chemistry and biology. On the other hand, a refinement of micro-chemical methods may reveal rayless transformation processes which cannot be detected by any physical methods and to which may be due, *e.g.*, the traces of helium in beryllium minerals discovered by Lord Rayleigh. A careful micro-chemical study of the elementary composition of minerals or of the production of new elements in salts will be able to throw light on such slow transmutation processes, and so contribute to the yet unsolved question as to the origin of our chemical elements.

Infra-Red Spectra

Their Relation to Molecular Structure

DR. J. J. FOX, the Government Chemist, addressed the Chemical Society of the University of Birmingham on the subject of "Infra-red Spectra and Their Relation to Molecular Structure," on December 7. The lecture was illustrated by slides and dealt shortly with the development of infra-red methods, the use of modern apparatus for exploring spectral regions up to 150μ and beyond that region. For chemists, said Dr. Fox, a landmark is the extensive investigations of Coblentz, some 30 years ago. He improved the existing apparatus and examined large numbers of organic and inorganic compounds, both in mission and absorption. This work led to the recognition of the fact that certain groupings in organic compounds frequently exhibited similar vibrations of the atomic nuclei, *e.g.*, C-H in aliphatic and aromatic compounds associated with 3.4μ and 3.25μ respectively.

With the greater resolution available through the use of ruled gratings, it became possible to examine the fine structure of individual bands and so to obtain some measure of the coupling of vibration and rotation. The striking work of Imes, in 1919, on HCl was described, as well as the more recent work of Barker on $^2H^{35}Cl$ and $^2H^{37}Cl$. The infra-red bands arising from symmetrical top molecules such as NH_3 and the methyl halides was described, and it was shown how the fine structure of the bands of NH_3 enabled the two moments of inertia to be ascertained. This led to calculations of the size of the NH_3 molecule, which showed that it was a rather flat pyramid of height 0.36 A, N-H distance 1.02 A, and H-H distance about 1.65 A.

Dr. Fox then proceeded to consider the case of some organic molecules, and referred to the investigations of Bonino, Ellis and Salant on the vibrations and overtones arising from C-H and N-H vibrations in molecules. The strength of single, double and triple bands as shown by the change in vibration of frequencies was referred to, and the effect of substitution of deuterium for hydrogen was considered briefly. "Inner" and "outer" vibrations of groups in molecules were considered and the general persistence of the former was exemplified. Reference was made to recent work of Errara *et al* in which the infra-red bands of tetramethyethylene were utilised to show the association of certain frequencies with definite groupings.

A description of the use by Wulf, Liddell, Hendricks and Hilbert of the overtones of the O-H and N-H groups in the region 1.3 to 1.6μ, for demonstrating the presence of such groups or their absence was given. The use of infra-red spectra in certain analytical problems and in questions of the proportions of isomers in mixtures was also discussed very briefly.

Organo-Metalloid Compounds.—II*

By SUDHIRCHANDRA NIYOGY

(Department of Applied Chemistry, University College of Science and Technology, Calcutta.)

FROM the published literature, it has been established that an antimonial, in order to be effective for the treatment of the disease caused by Leishmann-Donovann bodies, must conform to the structure of 4-aminophenylstibinic acid. Relying on this observation, an attempt was made to prepare 5-amino 2-acetylaminobenzyl alcohol, which by the application of well-known Bart-Schmidt reaction would give 2-acetylaminobenzylalcohol-5-stibinic acid. At the same time it was also considered to be of interest to investigate whether a stibinic acid with a CH_2OH group in - *o* - or *m*-position exhibits any marked physiological activity.

5-Nitro-2-Acetylaminobenzyl Alcohol

5-Nitro-2-acetylaminobenzyl alcohol was prepared by the method of Cohn and Springer,[1] from the acetyl derivative of 2-aminobenzaldehyde by nitration in sulphuric acid solution and Cannizaro's reaction, followed by subsequent acetylation. On reduction with iron and acetic acid, the nitro group was reduced to the amino body from which the stibinic acid was prepared as usual by diazo reaction. 3-Acetylaminobenzyl-alcohol-4-stibinic acid was prepared by the following series of reactions: 4-Nitro benzaldehyde, by Cannizaro's reaction, gave 4-nitrobenzyl alcohol which was smoothly reduced to the amino body in moist ether solution with Al-Hg couple. The method of reduction with zinc dust and calcium chloride[2] was found to be a tedious one to work with.

By heating with acetic anhydride and sodium acetate,[3] a diacetyl derivative m.p. 102° was obtained. On nitration with fuming nitric acid at 0-10°, 3-nitro-4-acetylaminobenzyl acetate was isolated in good yield, m.p. 82-83°. Deacetylation was effected as usual by heating with alcoholic sodium hydroxide. By diazotising the amino body in alcoholic hydrochloric solution and treating with antimony chloride, an additive compound of the diazonium chloride and antimony trichloride was obtained which was converted into the corresponding stibinic acid in pyridine solution (*cf.* Brit. Pat. 31,358, of 1928). After the reaction was over, the stibinic acid was isolated by dilution with water. The nitro-compound was reduced with ferrous hydroxide at 0-5° to 2-aminobenzyl-alcohol-4-stibinic acid, the acetyl derivative of which was prepared as usual.

Benzyl-Alcohol-4-Stibinic Acid

4-Aminobenzyl alcohol (12.3 g.) was dissolved in hydrochloric acid (15 c.c., d. 1.12) and diazotised with a solution of sodium nitrite (6.9 g.) at 0°. To this solution was added a solution of antimony trichloride prepared by dissolving antimony trioxide (14 g.) in hydrochloric acid (30 c.c., d. 1.18). After being stirred for a minute or two, a white crystalline solid separated. This was filtered off, washed free from antimony trichloride with dilute hydrochloric acid (d. 1.12) and then with water. The solid was then suspended in water, cooled to a temperature of 5-10° and a dilute solution of caustic soda gradually added to the suspension, with vigorous mechanical stirring, till distinctly alkaline in reaction. Vigorous evolution of nitrogen occurred and the stirring gear was kept in motion till the evolution of nitrogen had slackened. The alkaline liquid was then nearly neutralised with dilute sulphuric acid and saturated with carbon dioxide. The whole was then filtered and the filtrate acidified with dilute acetic acid when the stibinic acid separated as a gelatinous precipitate.

The stibinic acid was removed by centrifuging the liquid and freed from soluble inorganic impurities by dialysis. The insoluble impurities were then removed by dissolving the dialysed stibinic acid in dilute sodium carbonate solution and filtering off the insoluble impurities, if any. The slightly alkaline solution was then filtered and the pure stibinic acid precipitated by acidification with dilute acetic acid. The stibinic acid was then removed by filtration and washed repeatedly with water and alcohol till free from sodium acetate. It was then dried over fused calcium chloride *in vacuo*.

The sodium salt was prepared by dissolving the acid in the requisite quantity of dilute caustic soda, concentrating the solution *in vacuo* and precipitating the solution with a mixture of alcohol and ether. Light pink amorphous solid, decomposing on heating to 220° without melting. Very soluble in water. Insoluble calcium and barium salts may be prepared by adding calcium or barium chloride to a solution of the sodium salt.

Benzyl-Alcohol-3-Stibinic Acid

Benzyl-alcohol-3-stibinic acid was prepared in the manner as described in the previous paragraph, from 3-aminobenzyl alcohol. *The sodium salt* was prepared by dissolving the stibinic acid in dilute caustic soda and evaporating it to dryness *in vacuo*. The dry residue was then extracted with methyl alcohol or acetone, filtered and the filtrate treated with excess of ether when the sodium salt separated as a light pink amorphous mass. Filtered and dried *in vacuo* over liquid paraffin.

5-Amino-2-Acetylaminobenzyl Alcohol

Reduced iron dust (10 g.), acetic acid (4 c.c.) and water (50 c.c.) were placed in a round-bottomed flask. 5-Nitro-2-acetylaminobenzyl alcohol (10 g.) was gradually added to the mixture with vigorous stirring. The mixture warmed up and the temperature rose up to 50°. Further quantities of the nitro-compound was gradually added to this warm mixture during 60 minutes. After about two hours, the flask was warmed on a water-bath and a dilute solution of sodium carbonate (2 g.) in water (20 c.c.) was added. The sludge was filtered off with suction and the residue repeatedly extracted with hot water. The filtrate immediately deposited a crystalline solid which was filtered off and dried *in vacuo*. It was then crystallised from alcohol-benzene mixture, in glistening plates, m.p. 172-73°.

2-Acetylaminobenzyl-Alcohol-5-Stibinic Acid

The amino body (8 g.) was dissolved in dilute hydrochloric acid (40 c.c., d. 1.12), cooled to 0° and diazotised with sodium nitrite. To this cooled diazo solution, under vigorous agitation, was added an alkaline solution of sodium antimonite prepared by dissolving antimony trioxide (5 g.) in hydrochloric acid (15 c.c.) and treating with a concentrated solution of caustic soda (30 c.c. 1:1). After the vigorous evolution of nitrogen had ceased the liquid was nearly neutralised with dilute sulphuric acid, saturated with carbon dioxide for 15 minutes and filtered. The filtrate was concentrated to about half its volume *in vacuo* over sulphuric acid and salted out when the sodium salt of the stibinic acid separated as a light red flocculent precipitate. This was filtered off, dried *in* vacuo over fused calcium chloride, dissolved in absolute methyl alcohol and precipitated by the addition of dry ether as a colourless amorphous mass. Yield 2 g.

The precipitate was filtered and dried *in vacuo* over liquid paraffin. It is an amorphous mass with a pale pink colour, decomposes on heating at 240°, without melting, and is soluble in water and the free acid is precipitated by acidifica-

* Reprinted from the "Proceedings of the Indian Academy of Science," September, 1936.

[1] "Monatsh.," 1903, 24, 96.
[2] Fischer, "Berichte," 1895, 28, 880.
[3] Fourneau and Lestrange, "Bull. Soc. Chim.," 1933, 5, 330.

tion and redissolved by alkali. The dried sodium salt is soluble in cold methyl alcohol; it is insoluble in dilute mineral acids and other organic solvents. *The calcium or barium salt* is precipitated as a white amorphous mass when calcium or barium chloride is added to a solution of the sodium salt.

3-Nitrobenzyl-Alcohol-4-Stibinic Acid

The starting material in the production of 3-nitrobenzyl-alcohol-4-stibinic acid is 3-nitro-4-aminobenzyl alcohol which was prepared by the method of Fourneau and Lestrange.[3] Owing to the difficulty of diazotising this amine by ordinary method[3] the base (10 g.) was dissolved in alcohol hydrochloric acid, cooled in ice to 0° and treated with the necessary quantity of amyl nitrite. The solid diazonium chloride was then precipitated by the addition of ether and filtered off in the cold. It was then gradually added to a solution of antimony trichloride prepared by dissolving antimony trioxide (5 g.) in hydrochloric acid (15 c.c., d. 1.18). On stirring, a colourless crystalline precipitate separated. This was filtered off and dried carefully on a porous plate. The dry mass was then added in small quantities at a time to pyridine (50 c.c.) and stirred with a glass rod. The colour of the pyridine changed to red and the solid gradually went into solution.

After the addition of the whole of the solid the solution was warmed on a water-bath to 60°, till evolution of nitrogen had stopped (2 hours). A white solid was found to have separated. This was filtered off and found to be antimony trioxide. The clear liquid of a dark red colour was then diluted with water (500 c.c.) when a light pink gelatinous mass separated. This was filtered off and washed with dilute hydrochloric acid (d. 1.12) to remove antimony trioxide, if any, and then with water till free from acid. As the free stibinic acid is insoluble in organic solvents, it was purified through its sodium salt by precipitating a solution of the sodium salt in water with alcohol (twice). Finally it was dried *in vacuo* over fused calcium chloride.

For 3-aminobenzyl-alcohol-4-stibinic acid, to a solution of the sodium salt described above (8 g.) in *n*-caustic soda (100 c.c.), cooled to 0°, ferrous sulphate (50 g.) in water (100 c.c.) was added slowly with vigorous stirring, the temperature being maintained between 0 and 5°. *n*-Caustic soda (100 c.c.) was added to the mixture to make it distinctly alkaline and the stirring continued for 4 hours. The sludge of ferric hydroxide was then removed by centrifuging the liquid and the residue was extracted twice with 100 c.c. of 2 per cent. caustic soda. The united filtrates were concentrated *in vacuo* and the sodium salt precipitated by the addition of alcohol. The crude sodium salt was then removed by filtration and again dried *in vacuo*. The dried mass was repeatedly extracted with acetone and filtered; the filtrate was concentrated *in vacuo* and then precipitated by the addition of ether. Finally, the precipitated sodium salt was again dried *in vacuo* over calcium chloride—liquid paraffin.

3-Aminobenzyl-Alcohol-4-Stibinic Acid

The sodium salt is a yellowish white amorphous mass, decomposing at 230°, without melting. It is very soluble in water and fairly soluble in acetone. The free stibinic acid is obtained by acidification with dilute acetic acid and dissolves completely in dilute hydrochloric acid. Insoluble calcium salt is precipitated by adding calcium chloride to an aqueous solution of the sodium salt.

The acetyl derivative was prepared by warming the free stibinic acid (1 part) with twice the required quantity of acetic anhydride on a water-bath for a few minutes. On cooling the liquid, a precipitate separates which is filtered off and washed with hot water. The mass was then dissolved in sodium carbonate till just alkaline and again filtered from insoluble impurities, if any. The solution was then concentrated *in vacuo* over caustic soda and saturated with sodium chloride when the sodium salt separated as an amorphous mass. This was filtered off, dried *in vacuo*, dissolved in methyl alcohol and precipitated by the addition of ether, as a light red amorphous mass.

Size Reduction

By H. A. S. GOTHARD, A.M.I.Chem.E.

IN the preparation and manufacture of many chemical products the raw material must be reduced to a state of fine sub-division before use, and in numerous instances it is desirable that the finished article be marketed in the form of a fine powder or paste.

The reduction of a material may be accomplished either by crushing and splitting, or by cutting and tearing. Such operations are usually referred to as "grinding," but as the term is a general one embracing many functions, such as the shaping of metals by the surface application of abrasives, and the "lapping" of engine cylinders, when applied to the chemical and allied industries its use is interpreted as "size reduction." There are but very few branches of the chemical industry where this size reduction, in one form or another, does not play an important part, and the plant available for this purpose is of wide variety.

Grinding machinery is generally divided into three classes, namely, those in which the material is crushed or coarsely ground, those which provide a finely pulverised product, and those which produce the materials in the form of paste. Among the machines used for crushing very hard materials the most simple and inexpensive is the "jaw crusher." This type of machine performs its operation by cracking or crushing the material between a pair of heavy steel jaws, one of which is fixed and the corresponding or "working" jaw is caused to apply pressure against it by means of a cam operated reciprocating motion. There are numerous modifications and refinements of this type of machine, some of which have a movable jaw pivoted at the top, thus giving the greatest movement to the smallest lumps, and others are provided with a movable jaw pivoted at the bottom, which enables the largest lumps to be given the maximum movement.

Other machines used for coarse grinding are crushing rolls, ring roller mills, rotary crushers, swing-hammer crushers, and gyratory crushers. Machinery of this type performs its task by the application of continuous pressure, which may be applied either directly, or by centrifugal force as in the case of ring roller mills. These machines are nearly always employed for the reduction of hard or semi-hard materials of large size, such as ores, phosphate rocks, limestone, and coal.

In the second class, reduction is effected by means of blow or impact, and the machinery used includes stamp mills, ball mills, tube mills, pebble mills, and attrition mills. The most generally employed and useful are the ball mills and pebble mills. These machines consist of a cylindrical, conical, or spheroidal shell, rotating on a horizontal axis, and charged with the grinding medium which may be steel balls, flints or pebbles of either regular or irregular shape. Some mills of this type are "wind-swept," that is, a strong current of air is continuously passed through the mill to remove the finer particles as they are ground; others are fitted with means for continuous feed and discharge. Ball mills and pebble mills are used for both wet and dry grinding, and also for mixing enamels, fertilisers, etc.

There are certain materials which it is extremely difficult to grind, particularly those of a soft or resilient nature, examples

of which are to be found in certain drugs and seeds, flour, pigments and clays. Such substances are ground and mixed in edge-running mills and buhrstone mills. The latter, used for grinding flour and cereals, is the modern adaptation of the old millstones.

Finally, there are the colloid mills, and homogenisers. Machines of this type are used to reduce materials to a condition of extreme fineness or, as the name implied, a colloidal state. Such mills are obtainable in various forms and designs, but in all, the operating results depend upon the speed of rotation and the grinding area.

In the selection of grinding machines it is necessary carefully to consider several important factors, first and foremost of which is the nature of the material and its intended purpose. Some materials are sensitive to temperature changes, others have a tendency to agglomerate; many chemicals are unstable, and an excessive rise in temperature may cause them to ignite or explode. Efficiency in all grinding operations is largely determined by the size and particle shape of the feed, as well as that of the finished product, and by an intimate knowedge of both the physical and chemical characteristics of the material to be reduced.

In order to facilitate the selection of suitable plant, most manufacturers invite potential purchasers to submit samples of their material for " test " grinding, together with a specification of their requirements. A detailed report is usually furnished, stating the type and size of machine required for a given output.

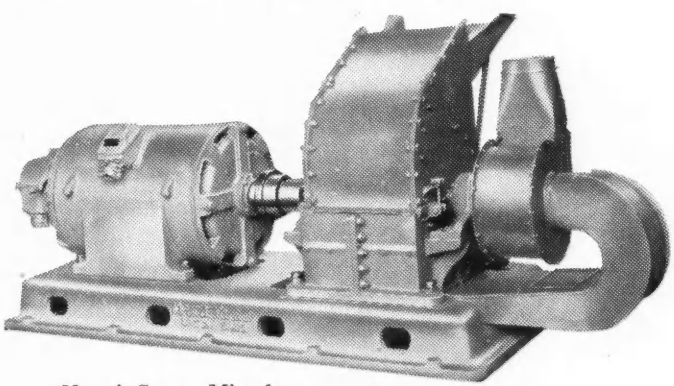
Some Typical Grinding Mills

A REPRESENTATIVE of THE CHEMICAL AGE recently had the opportunity of visiting the works of Miracle Mills, Ltd., and witnessing demonstrations of a series of mills in operation. Three of the mills are illustrated here, *viz.*, the No. 4 " Super," directly coupled to motor with cast bedplate; the " Junior," for the lighter job met with in the laboratory and works; and the " Master," which sieves while grinding. The Miracle mill has been evolved by the practical application of the swing hammer principle of grinding, and simplicity and accessibility have been among the foremost considerations in its construction. The grinding principle is that of shattering by impact and the rejection of the material, as against the old method of friction grinding, resulting in a reduction of power consumption.

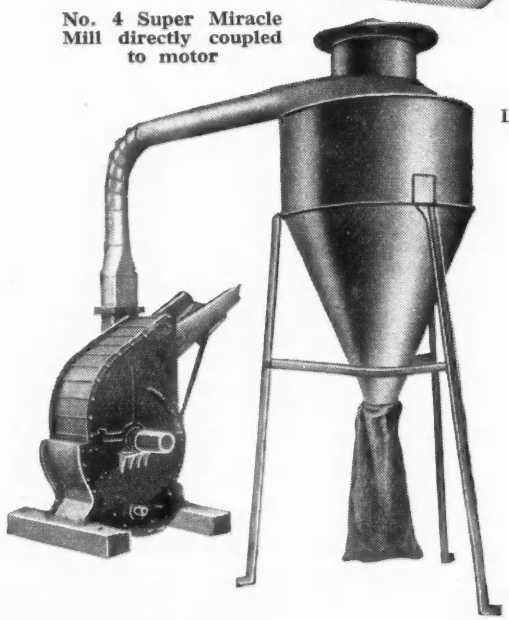
An advantage of the application of the swing hammer principle is that if a piece of metal or very hard stone should get into the mill, the hammers or maces which strike it can swing back in between the discs on which they are carried, leaving a clearance between the screen and the hammer or mace head, thus reducing the risk of damage to a minimum.

All types of Miracle mills combine the three operations of pulverising, grading and transporting. Cool grinding is performed with a minimum of power. The degree of fineness is determined by the size of the screen used and recourse to dressing is unnecessary. By merely changing the screen, the degree of fineness can be varied to meet almost any requirement. This operation can be effected in less than 30 seconds. The fan attached to the " Miracle " shaft removes the finished product from the grinding chamber and automatically delivers this into the collector supplied with the unit. Friction is eliminated, and with a cool draught of air (created by the fan) through the mill, materials such as bitumen, gums, skin, sugar, salt, etc., can be successfully pulverised. No skilled labour is required; the mill is foolproof. To obtain the maximum output, the feed should be regular, and in cases where this is difficult to arrange an automatic feeder is recommended.

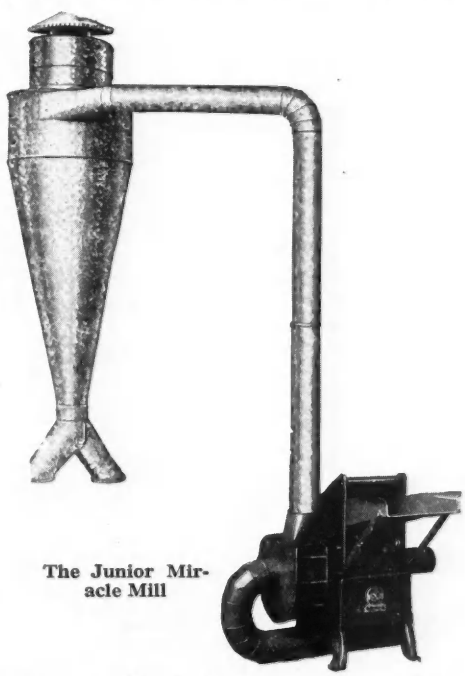
The company has issued a a list of nearly 800 users of its mills in representative trades.



No. 4 Super Miracle Mill directly coupled to motor



Left—The Master Miracle Mill



The Junior Miracle Mill

New Technical Books

DIFFERENTIAL EQUATIONS IN APPLIED CHEMISTRY. By Frank Lauren Hitchcock and Clark Shove Robinson. Second Edition. Pp. 120. John Wiley and Sons (Chapman and Hall, Ltd.). 7s. 6d.

The purpose of this book is not to teach chemistry but to teach mathematics in a form readily assimilated by chemists and chemical engineers. Just as chemistry itself cannot well be understood, except as a branch of science in a wider aspect, so, too, the principles of mathematical chemistry are often most clearly brought out by the study of problems much broader in their applications than any specific technical requirement. The practical needs of the chemical engineer are constantly kept in sight, and much emphasis is placed on graphic methods and on numerical work. After careful consideration the answers to the problems have, with a few exceptions, been omitted, as the authors believe that a chemist or an engineer, or a young man about to become an engineer, should possess sufficient stability of mind to check his own calculations. In this new edition the problem lists have been revised and a considerable number of new problems added, with increased emphasis on the study of actual experiments.

* * *

ORGANIC CHEMISTRY. VOL. I. CHEMISTRY OF THE ALIPHATIC SERIES. By Victor von Richter. Third Edition. Pp. 790. Kegan Paul, Trench, Trubner and Co., Ltd. 35s.

This is the sixth edition in the English language of Richter's "Organic Chemistry," three American editions preceding the first English one. It follows 15 years after the first English edition, and includes all the new and revised matter of the twelfth German edition, and a good deal of further matter which it was felt desirable to insert. It is realised that with the great advances which are now taking place on the theoretical side of organic chemistry some subjects may appear inadequately dealt with, and in places the presentation may appear somewhat old-fashioned, but without entirely rewriting and rearranging the introductory section, which would entirely alter the individuality of the book, this is largely inevitable. As suggested in several reviews of the last edition, the replacement of the numerous "Centralblatt" references by their originals has been done from 1910 onwards. In matter of nomenclature, where the English and German usage varies, English custom has been followed. Thus the substance originally described as "glucose" is referred to as glucofuranose rather than heteroglucose. The use of Greek letters for indicating position in open chains has been continued, with the exception of sugar derivatives, where the use of Arabic numerals has become more or less universal.

* * *

THE SYSTEMATIC IDENTIFICATION OF ORGANIC COMPOUNDS. By Ralph L. Shriner and Reynold C. Fuson. Pp. 195. John Wiley and Sons (Chapman and Hall, Ltd.). 11s.

Laboratory courses designed to teach methods for the identification of organic compounds have become increasingly popular since the foundations in this field were laid by Mulliken, whose classic work, "The Identification of Pure Organic Compounds," was published in 1904. The ability to identify compounds—valuable as it is to organic chemists—is, however, not the primary reason for the great popularity of laboratory courses in the subject. The great difference between this and other types of laboratory courses usually included in chemical curricula is that as yet no scheme has been devised which reduces this work to the mere following of directions. At every step in the identification of compounds by present methods the student is required to exercise his own judgment. His faculty for careful observation, his ability to make correct deductions from his observation, and his originality in planning his work are therefore at a premium. In this work students not only become aware of the necessity for research, but are also introduced to the methods which it involves. A natural and important outgrowth of this interest in identification methods is the large amount of research which has been done in this field, particularly in connection with the preparation of derivatives suitable for characterisation and identification work. The present book is the outgrowth of several years of experience with the subject, both on the teaching side and from the research point of view. The laboratory exercises herein presented are those used at the present time at the University of Illinois, in a one-semester course of six hours duration a week. The work is of such a nature, however, that it can be readily adapted to longer or shorter courses by merely increasing or decreasing the number of unknown compounds assigned for identification. The course is primarily designed for students who have had one year of organic chemistry.

Bituminous Filling Compounds

New Standard Specification

FOR years there has been a demand for a standard specification for filling compounds for switchgear and cable boxes. As regards the former of these uses of filling compounds, a British Standard Specification (No. 688, 1936) has now been published, and a corresponding specification for cable-box compounds is in preparation.

The specification was prepared at the request of, and on the basis of data supplied by, the Electrical Research Association, and applies to fluid, plastic and hard bituminous compounds suitable for use as filing compounds which are subjected to electrical stress in service in electrical apparatus other than cable boxes. Oils and oil-resisting compounds are, however, excluded. There are five classes of compounds, graded according to their softening points, these ranging from "less than 40° C." up to "not below 120° C." The properties for which limits are set, and tests prescribed, include solubility in carbon disulphide, viscosity, softening point, electric strength, flashpoint, ash, freedom from acidity and injurious sulphur, resistance to moisture, adhesiveness, penetration, brittleness and contraction.

Wool Industries Research

Report of the Year

AT the 18th annual general meeting of the Wool Industries Research Association, whose headquarters are at Torridon, Headingley, Leeds, Mr. B. H. Wilsdon, director of research, in presenting his report on the work of the year, said that despite anxieties over finance considerable progress had been made in several important directions.

Recent technical developments in the new chlorination process for producing unshrinkable wool had now reached a stage where release for the treatment of wool in top or at previous stages of manufacture had been recommended after careful examination by the technical panel which had been considering the results. It remained only for the Association to complete the business arrangements whereby its members would be able to take up the process on a commercial scale.

Another major line of work was connected with bleaching. A new method of bleaching employing sulphite solutions—the so-called neutral bleach—had been patented in 1931, and was now adopted in the industry. The method conferred an improved bleach which prevented that rapid yellowing of wool which sometimes occurred on washing and which could prove such a serious drawback in the use of whites. Current work had been directed at some of the fundamental problems connected with this discovery from which additional improvements might be expected.

Research on the fundamental properties of the wool fibre was the surest way of maintaining its pre-eminence among the textile fibres. In the two subjects mentioned, research had shown practicable ways of overcoming two major defects which limit the use of wool.

Personal Notes

MR. H. T. OPENSHAW, B.A., B.SC., of Magdalen College, Oxford, who has just been elected to a senior demyship, is conducting investigations into the structure of alkaloids, particularly strychnine. He obtained a first class in the Honour School of Chemistry in 1935.

DR. J. T. DUNN, a past president of the Society of Chemical Industry, was unable, owing to illness, to fulfil his appointment to address a joint meeting of the Institute of Chemistry and the Society of Chemical Industry at Newcastle on Friday.

MR. J. M. HENDERSON, who has recently been appointed head of the costing section of Imperial Chemical Industries, Ltd., at Millbank, London, in succession to the late Mr. A. R. Young, is a native of Crosshouse, Ayrshire. In 1918 he was appointed to the accountancy staff at the Government factory at Irvine, and became chief accountant there.

SIR HERBERT JACKSON has died at his home at Hampstead, aged 73. Sir Herbert, who became an F.R.S. in 1917, was made a K.B.E. the same year. He was appointed Professor of Organic Chemistry at King's College, London, in 1905, and became Daniell Professor of Chemistry in 1914. In 1918 he was appointed to the post of Director of Research to the British Scientific Instrument Research Association, where he remained until 1933. He was president of the Röntgen Society from 1901 to 1903, and of the Institute of Chemistry from 1918 to 1921.

MR. G. A. LEITCH has been appointed chairman of Cannon Iron Foundries, in place of the late Sir Francis H. Pepper.

LORD RAYLEIGH is to be appointed a member of the Royal Society Mond Laboratory Committee at Cambridge University.

MR. KENNETH S. BURCH has been appointed technical director of Rex Campbell and Co., Ltd., and Mr. Albert C. Garnham has been appointed secretary.

MR. DUNDAS SIMPSON, chemical manufacturer, of Western Road, Leigh-on-Sea, Essex, was granted a decree nisi with costs on December 11, and damages against the co-respondent were assessed by the Divorce Court jury at £1,750.

DR. F. L. PYMAN has been appointed president of the Chemistry Section of the British Association, and Sir Alexander Gibb is to be president of the Engineering Section. The 1937 meeting will be held at Nottingham, September 1 to 8, under the presidency of Sir Edward Poulton.

PRINCESS CAROLINE OF SCHOENAICH-CAROLATH, daughter of Princess Hermine, the ex-Kaiser's second wife, was married at Wilmersdorf on December 10 to Herr Herbert Hartung, who is employed in the petrol department of the Leuna Chemical Works. Herr Hartung is the second member of the staff of the I.G. Farbenindustrie (of which the Leuna works are a subsidiary) to become engaged to a princess. Prince Bernhard von Lippe-Biesterfeld, the fiance of Princess Juliana of Holland, was until recently working for the company.

Chemical Notes from Foreign Sources

Norway

THE ERECTION OF SUGAR REFINERIES in Norway is to be considered by a commission, of which Professor Halvorsen is chairman. At present there is no domestic sugar industry, and the country relies mainly on British refineries.

Latvia

THE DAILY CASEIN OUTPUT of the factories operated by the Co-operative Latvian Dairies is now 2.6 tons and the factories give employment to 50 workers.

Poland

CARBIDE FURNACES WHICH HAVE BEEN IDLE since 1928 are being restarted at the State Nitrogen Works at Chorzov.

A SPECIAL PROCESS FOR PRODUCING GLUE for the hot-veneering of wood is being operated under licence by the Strem Co., of Warsaw.

THE KOSMAPHARMA CO. has been registered in Kattovitz, with a capital of 20,000 zloty, and will engage in the manufacture and merchanting of cosmetic and pharmaceutical products.

Russia

THE MANUFACTURE OF CAMPHOR is being initiated in the U.S.S.R. this year. The raw material, camphor-basil, which was imported from Africa in 1928, is now cultivated in the southern districts of the Soviet Union.

A TITANIUM REFINING PLANT has been set in operation in Goroblagodaj by the "Vostokorud" Trust. The new plant is to produce annually 15,000 tons of concentrate, with a content of 45.5 per cent., for the manufacture of titanium white.

A NEW PLANT FOR PRODUCTION OF ILMENITE CONCENTRATES has been started up at the Goroblagodatsk works of the Wostrokruda Trust. The output for next year of the new plant is estimated at 15,000 tons, which is more than enough to satisfy the demand of the paint industry for titanium white.

Estonia

CRUDE SHALE OIL PRODUCTION for the current year is estimated at about 80,000 tons, which is about twice the previous year's output.

Hungary

SULPHUR WILL BE PRODUCED FROM PYRITES by Metallochemia, Ltd., according to their contract with the Recak Mining Co. Sulphur has not hitherto been produced in Hungary.

Rumania

THE ERECTION OF A LITHOPONE FACTORY by the Phœnix Chemical Works has been authorised by the Hungarian Government. When in production, the import duty on lithopone may be raised.

Czechoslovakia

A SUGAR REFINERY IS BEING BUILT by the Agricultural Sugar Works of Malé Prosenice at a cost of 8 million kronen. Its daily capacity will be 250 tons.

A NEW ULTRAMARINE WORKS, which will remain outside the Czech Ultramarine Cartel, will be in operation early in 1937 under the title of "First Prague Ultramarine Factory."

Japan

EXTENSIVE PYRITES DEPOSITS have been acquired in Hokkaido by Dainippon Jinzohiryo K.K.

TO EXPAND ITS MERCURY OUTPUT, the Toyo Snigin Kogyo K.K. (Oriental Mercury Company) is increasing its capital from 3 to 6 million yen.

PRODUCTION OF DYESTUFFS AND MEDICINAL PRODUCTS from tar is projected by the Kyushu Soda K.K., which has raised its capital from 10 to 15 million yen.

A SOYA BEAN MEAL FACTORY has been opened by the new Nichiman Oil Manufacturing Co., which has a capital of three million yen. The mill will produce 16,000 tons of meal annually, from 100,000 tons of beans.

British Overseas Chemical Trade in November

According to the Board of Trade returns for the month ended November 30, 1936, exports of chemicals, drugs, dyes and colours were valued at £1,828,179, as compared with £1,957,074 for November, 1935, a decrease of £128,895. Imports were valued at £1,041,670, as compared with £1,023,655 for November, 1935, an increase of £18,015. Re-exports were valued at £28,229.

Imports

	Quantities. November 30, 1935.	Quantities. November 30, 1936.	Value. November 30, 1935.	Value. November 30, 1936.
Acids—				
Acetic .. .. cwt.	14,776	18,940	19,772	22,170
Boric (boracic) .. ,,	2,280	2,100	2,478	2,093
Citric .. .. ,,	1,210	490	4,813	1,998
Tartaric .. .. ,,	3,580	1,590	14,614	6,509
All other sorts .. value	—	—	11,166	6,338
Borax .. .. cwt.	11,398	14,303	7,909	8,059
Calcium carbide .. ,,	111,160	116,888	64,730	68,415
Fertilisers, manufactured—				
Superphosphate of lime .. tons	2,043	1,106	4,457	2,288
All other descriptions ,,	3,589	3,203	15,300	16,161
Phosphorus .. cwt.	1,444	11	3,907	67
Potassium compounds—				
Caustic and lyes cwt.	10,759	9,064	12,550	9,823
Chloride (muriate) ,,	86,680	107,385	26,536	38,203
Kainite and other mineral salts .. ,,	120,651	45,853	19,198	7,641
Nitrate (saltpetre) ,	4,024	14,015	3,852	7,050
Sulphate .. ,,	22,082	79,633	8,985	38,709
All other compounds ,,	9,511	12,138	13,794	18,094
Sodium compounds—				
Carbonate, including crystals, ash and bi-carbonate ,,	15	—	8	—
Chromate and bichromate .. .. ,,	638	4,201	1,057	4,956
Cyanide .. .. ,,	3,819	5,517	9,431	13,238
Nitrate .. .. ,,	500	38,060	110	8,087
All other compounds ,,	29,276	23,244	29,392	22,256
Other chemical manufactures .. .. value	—	—	267,964	282,893
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	166,623	166,903	13,680	12,824
Medicinal oils .. cwt.	4,481	2,182	14,229	8,285
Proprietary medicines value	—	—	60,221	36,426
All other sorts .. value	—	—	45,932	62,727
Dyes and dye-stuffs and extracts for tanning—				
Finished dyestuffs from coal tar .. cwt.	4,972	3,661	137,862	104,207
Extracts for dyeing ,,	4,305	4,062	10,970	8,416
Extracts for tanning (solid or liquid)—				
Chestnut .. cwt.	43,867	22,059	30,610	14,683
Quebracho .. ,,	14,678	30,478	11,975	26,756
All other sorts .. ,,	27,777	32,679	18,826	23,740
All other dyes and dyestuffs .. .. cwt.	721	1,098	15,534	19,897
Painters' colours and materials—				
White lead (basic carbonate) .. cwt.	7,151	8,016	9,427	11,279
Lithopone .. ,,	17,088	21,966	11,127	13,814
Ochres and earth colours cwt.	34,536	37,802	11,516	12,305
Bronze powders ,,	2,260	1,991	15,488	12,895
Carbon blacks .. ,,	23,792	29,095	36,152	44,490
Other pigments and extenders, dry .. ,,	36,411	36,707	9,361	10,372
All other descriptions ,,	16,365	15,982	28,722	33,506
Total .. .. value	—	—	1,023,655	1,041,670

Exports

	Quantities. November 30, 1935.	Quantities. November 30, 1936.	Value. November 30, 1935.	Value. November 30, 1936.
Acids—				
Citric .. .. cwt.	3,836	2,455	17,166	11,348
All other sorts .. value	—	—	29,081	21,881
Aluminium compounds tons	2,199	3,698	16,637	37,430
Ammonium compounds—				
Sulphate .. tons	16,082	13,572	94,450	90,032
All other sorts .. ,,	1,687	1,326	22,886	16,784
Bleaching powder (chloride of lime) .. cwt.	81,175	69,905	21,660	18,135
Coal tar products—				
Cresylic acid .. gal.	208,646	171,418	17,412	23,228
Tar oil, creosote oil, anthracene oil, etc. gal.	1,241,248	1,871,103	31,716	44,674
All other sorts .. value	—	—	17,989	22,705
Copper, sulphate of tons	1,737	1,394	25,181	22,217
Disinfectants, insecticides, weed killers, etc. cwt.	31,173	32,854	67,549	73,611
Fertilisers, manufactured .. .. tons	16,117	31,096	58,726	86,258
Glycerine .. .. cwt.	9,350	15,200	23,142	41,840
Lead compounds .. ,,	15,310	16,594	19,416	23,269
Magnesium compounds tons	571	478	14,229	11,404
Potassium compounds cwt.	6,984	6,928	14,458	12,317
Salt (sodium chloride) tons	28,996	26,308	63,459	66,039
Sodium compounds—				
Carbonate, including crystals, ash and bi-carbonate .. cwt.	383,275	377,435	89,699	76,039
Caustic .. .. .. cwt.	256,905	185,586	125,738	78,428
Nitrate .. .. ,,	19,194	20,106	6,316	6,654
Sulphate, including salt-cake .. .. cwt.	74,286	62,824	6,373	7,012
All other sorts .. ,,	82,884	70,737	88,052	88,090
Zinc oxide .. .. tons	1,555	1,597	28,158	27,787
All other descriptions value	—	—	269,173	207,811
Drugs, medicines, etc.—				
Quinine and quinine salts .. .. oz.	167,681	264,213	18,404	23,509
Proprietary medicines value	—	—	112,212	122,474
All other descriptions ,,	—	—	149,125	130,929
Dyes and dyestuffs and extracts for tanning—				
Finished dyestuffs from coal tar—				
Alizarine, alizarine red and indigo (synthetic) cwt.	2,510	2,065	17,384	13,023
Other sorts .. ,,	9,827	6,964	134,109	87,357
All other descriptions ,,	21,130	24,056	30,284	27,383
Painters' colours and materials—				
Pigments and extenders, dry—				
Ochres and eath colours cwt.	17,313	15,904	17,616	13,771
Other descriptions cwt.	30,470	34,288	46,349	43,029
White lead .. ,,	6,047	7,797	12,937	16,323
Paints and painters' enamels, prepared cwt.	38,952	40,375	103,030	105,401
Varnish and lacquer (clear) .. gal.	75,905	69,725	29,383	28,698
Printers' ink .. cwt.	4,997	3,595	31,592	22,350
All other descriptions ,,	43,536	39,173	85,983	78,939
Total .. .. value	—	—	1,957,074	1,828,179

Re-Exports

	Quantities. November 30, 1935.	Quantities. November 30, 1936.	Value. November 30, 1935.	Value. November 30, 1936.
Chemical manufactures and products .. value	—	—	15,899	12,151
Drugs, medicines and medicinal preparations cwt.	—	—	11,640	11,903
Dyes and dyestuffs and extracts for tanning cwt.	934	2,171	2,359	2,784
Painters' colours and materials .. .. cwt.	569	1,091	1,233	1,391
Total .. .. value	—	—	31,131	28,229

From Week to Week

THE GUARANTEE FUND FOR THE SCOTTISH EMPIRE EXHIBITION has now reached £562,000.

AN OUTBREAK OF FIRE OCCURRED at the laboratories of the Cleveland works of Dorman, Long and Co., Ltd., on December 11, when a section of the testing department with its scientific instruments was destroyed.

THE FOLLOWING are the officers of the British Section of the International Society of Leather Trades' Chemists for 1937: President, Dr. R. H. Marriott; vice-president, R. Faraday Innes; hon. treasurer, Dr. D. Burton; hon. secretary, Mr. A. Harvey; members of committee, Dr. E. W. Merry, Mr. F. H. Quinn and Mr. M. C. Lamb.

ONE OF A NUMBER OF DISTILLING PLANTS in a large open yard at the works of the Midland Tar Distilleries, Ltd., Monmore Green, Wolverhampton, caught fire on December 9, and necessitated the attendance of the Wolverhampton fire brigade. The fire is said to have been caused by liquid spurting from a valve and falling upon a hot surface where it ignited.

SIX MEN AT LEICESTER CORPORATION GASWORKS were burned in an explosion which occurred on December 10. They were clearing the oxide from the purifying box, when there was a flash and red-hot oxide was sprinkled over them. They were all taken to Leicester Royal Infirmary, and, after being treated, were allowed to go home.

GAINSBOROUGH URBAN COUNCIL has accepted a recommendation from the Gas Committee to erect a benzol extraction plant, at a cost of £1,490. From this plant benzol and naphtha will be extracted, leaving a coke deposit, for which there is a keen demand. On the committee's recommendation being approved, the tender of the Chemical Engineering Co., and Wilton's Patent Furnace Co., Ltd., London, for the plant, was accepted.

THE ISSUE OF "SANDS, CLAYS AND MINERALS" for November, 1936, published by A. L. Curtis, P.O. Box 61, Chatteris, Cambs., commences a new volume for which a larger size page has been adopted. This issue, moreover, is considerably enlarged and consists of 76 pages with 29 illustrations. The leading article is entitled "Great Empire Builders"; there is an interesting illustrated account of the nickel mines and smelters in Canada.

THERE WERE 114 FURNACES IN BLAST at the end of November, four having been blown in during the month, and three put out of operation. The production of pig-iron in November amounted to 643,100 tons, compared with 670,300 tons in October and 529,500 tons in November, 1935. The month's production includes 152,700 tons of hematite, 345,100 tons of basic, 116,500 tons of foundry and 15,100 tons of forge pig-iron. The production of steel ingots and castings in November amounted to 1,001,300 tons, compared with 1,060,500 tons in October, 1936, and 903,300 tons in November, 1935.

ON THE RECOMMENDATION of the Import Duties Advisory Committee, an Order has been issued removing oxalic acid from the free list of the Import Duties Act. The committee explains that, although oxalic acid is a synthetic organic chemical, it was exempt from key industry duty until August. Since January it has been exempt from the general *ad valorem* duty chargeable under the Import Duties Act, but recently commercial production in this country has become substantial in relation to home consumption, and the acid has therefore been made subject to the key industry duty. Accordingly, the reasons for which the committee recommends that it should be added to the free list are no longer valid.

GIVING EVIDENCE BEFORE THE HOUSE OF LORDS SELECT COMMITTEE which is investigating the question of damage done to agriculture by the ravages of rabbits, Dr. J. Kennedy, of Imperial Chemical Industries, Ltd., said that I.C.I. had a gas which would kill rabbits and leave the carcases quite fit for human consumption. It has already been pointed out in other circles, however, that the extermination of rats is far more important to the farmers throughout the country. The marketing of gas-killed rabbit carcases for food would also pave the way for dishonest practices concerning the guarantee of freshness, with possible outbreaks of illness due to food poisoning, and the public should object to any proposed marketing scheme.

THE NOVEMBER SHIPMENTS OF CHINA CLAY were not so good as those recorded for October last, but will be found considerably better than the shipments made in November, 1935. The shipments are as follows: Fowey, 46,993 tons china clay; 3,435 tons china stone; 1,633 tons ball clay. Par, 9,014 tons china clay; 146 tons china stone. Charlestown, 4,018 tons china clay; 871 tons china stone. Padstow, 1,161 tons china clay. Newham, 187 tons china clay. Plymouth, 44 tons china clay. By rail, 5,303 tons china clay, making a total of 72,805 tons compared with 80,234 tons for the previous month. An interesting feature of the revival of the china clay trade with Italy has been provided at Fowey during the past week by the first consignment of 400 tons for Genoa since the trade restrictions were imposed consequent on the Italo-Abyssinian dispute.

SEVEN THOUSAND WORKERS at the works of Imperial Chemical Industries, Ltd., at Billingham, have applied for an increase of wages amounting to 6s. per week.

PROMPT ACTION BY WORKMEN prevented a serious blaze at the Marley Hill Chemical Works, when a creosote tank caught fire on December 11. Workmen extinguished the flames with sand.

A VERDICT OF MISADVENTURE was returned at a St. Helens inquest on Tuesday on Albert Brown, aged 31, of St. Helens, who died following scalds received at the British Sidac Works, Sutton Oak, St. Helens, on Sunday. Brown fell into a bath containing a hot solution of caustic soda and sodium sulphide.

A NEW I.C.I. PATTERN CARD, "Fashionable Shades on Pedalene," has been produced in collaboration with the British Colour Council to give the dyers of hatting materials, other than wool and fur felts, an indication of the shades that are expected to be in vogue during the spring and summer of 1937.

THE BRITISH SUGAR CORPORATION, Peterborough, on December 15 made payment for the past month's deliveries of sugar beet to their factory, the 3,300 cheques sent out, totalling £196,500, this being in respect of about 100,000 tons of beet. Spalding Beet Sugar Factory sent cheques amounting to £143,000 to 2,600 growers in South Lincolnshire, for the month's deliveries.

THE INSTITUTE OF CHEMISTRY has published in booklet form the eighth Gluckstein Memorial Lecture delivered on November 5, by Dr. R. H. Pickard, president of the Institute, on "An Experiment in Co-operative Research in the Cotton and Other Textile Industries," and the nineteenth Streatfeild Memorial Lecture delivered on Novmber 20, by Professor John Read on "A Chapter in the Chemistry of Essential Oils."

OWING TO THE INCREASED BUSINESS of G. W. B. Electric Furnaces, Ltd., and its associated company, Wild-Barfield Electric Furnaces, Ltd., extended accommodation has been found necessary. From January 1 the registered office of the company, together with the sales department, drawing office and accounts department, will be at Belgrave House, Belgrave Square, W.C.1 (Telephone: Terminus 5191-2). Wild-Barfield Electric Furnaces, Ltd., will remain at North Road, Holloway.

THE SECOND REPORT of the Department of Scientific and Industrial Research on the corrosion of the tinplate container by food products (Food Investigation Special Report No. 44) states that glass is still the only serious rival to tinplate for containers for food. The glass used is now highly resistant to "blows" and changes of temperature, and rapid mechanical handling, filling, and hermetic sealing with metal caps may reduce the cost almost as low as tinplate. It is suggested that in all probability the corrosion of cans by foodstuffs will eventually be overcome by improvements in lacquers and methods of lacquering. Failing such a development, relief must be sought through improvements in the tin coating, in the steel-base, the cool storage of canned goods, and the application of knowledge concerning the corrosion of tinplate.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

Mortgages and Charges

(NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALCOCK (PEROXIDE), LTD., Luton. (M., 19/12/36.) December 5, £25,000 debenture to Westminster Bank, Ltd.; general charge. *Nil. October 4, 1935.

ILLINGWORTH CARBONISATION CO., LTD., Manchester. (M., 19/12/36.) December 4, £856 debentures, part of a series already registered. *£36,700. January 3, 1936.

SYNPLAS, LTD., London, N.W., manufacturers of plastic materials, etc. (M., 19/12/36.) November 30, £4,250 mortgage, to Allnatt Holding Co., Ltd.; charged on 61 Minerva Road, Chase Estate, Park Royal, etc. *£1,500. December 31, 1935.

Satisfactions

BAXENDEN CHEMICAL CO., LTD. (formerly British Saccharin Manufacturing Co., Ltd.), Hull. (M.S., 19/12/36.) Satisfaction December 7, £2,640, registered July 13, 1921.

Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Open to Public Inspection

PROCESS FOR THE MANUFACTURE OF A THIOUREA DERIVATIVE.—I. G. Farbenindustrie. May 29, 1934. 457,471.

MANUFACTURE AND PRODUCTION OF VALUABLE AZO DYESTUFFS.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). May 29, 1935. 457,525.

MANUFACTURE AND PRODUCTION OF PIGMENT DYESTUFFS.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). May 29, 1935. 457,526.

MANUFACTURE OF THIAZOLE DERIVATIVES.—W. Baird, J. S. H. Davies, and Imperial Chemical Industries, Ltd. May 29, 1935. 457,477.

MANUFACTURE OF MORPHOLINE and homologues thereof.—Carbide & Carbon Chemicals Corporation. July 12, 1934. 457,481.

METHOD OF PRODUCING SYNTHETIC RESINS.—I. Rosenblum. May 31, 1935. 457,494.

MANUFACTURE OF ORTHO-BENZYL-SALICYLIC ACIDS and derivatives thereof.—W. W. Groves (Monsanto Chemical Co.). May 31, 1935. 457,396.

DEVICES FOR PRODUCING ACETYLENE GAS.—H. Gebhardt. May 31, 1935. 457,539.

WASHING OUT GASEOUS WEAK ACIDS from gases.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). June 4, 1935. 457,343.

MANUFACTURE OF 4-AMINO-3:4¹-DINITRODIPHENYLAMINE and of azo-dyestuffs therefrom.—I. G. Farbenindustrie. June 2, 1934. 457,534.

MANUFACTURE OF 4-AMINO-6-METHYL-3:4¹-DINITRODIPHENYLAMINE.—I. G. Farbenindustrie. Nov. 28, 1934. 457,535.

MANUFACTURE OF LIQUORICE EXTRACT.—Y. Ito. July 5, 1935. 457,349.

PRODUCTION OF VALUABLE PRODUCTS from solid carbonaceous materials by destructive hydrogenation.—International Hydrogenation Patents Co., Ltd. July 31, 1934. 457,211.

CELLULOID AND THE MANUFACTURE THEREOF.—G. S. Adlington, and L. A. White. July 18, 1935. 457,350.

VACUUM DISTILLATION OF HYDROGEN PEROXIDE and other easily decomposable liquids.—J. Mercier. Aug. 21, 1934. 457,291.

CATALYTIC HYDROGENATION PROCESS.—Rohm and Haas Co. Oct. 11, 1934. 457,358.

CALCIUM HYPOCHLORITE PELLET.—W. S. Bachman. Nov. 8, 1935. 457,416.

PROCESS FOR THE MANUFACTURE OF 2.4-DINITRO-3:6-DIHALOGENANILINES.—Chemical Works, formerly Sandoz. Nov. 24, 1934. 457,518.

AERATING DEVICE for use in the production of acetic acid from alcohol.—M. Williams. Feb. 17, 1936. 457,243.

PROCESS FOR OBTAINING MORPHINE and codeine.—Hoffman-La Roche and Co., A.-G. June 7, 1935. 457,433.

RUBBER-LIKE CHLORO-2-BUTADIENE-1, 3 POLYMERS.—United States Rubber Products, Inc. May 4, 1935. 457,310.

RUBBER-LIKE CHLORO-2-BUTADIENE-1, 3 POLYMERS.—United States Rubber Products, Inc. May 4, 1935. 457,311.

MANUFACTURE OF FINELY DIVIDED SUBSTANCES for use, for example, in rubber mixings.—Soc. Italiana Pirelli. May 3, 1935. 457,437.

RECOVERY OF BERYLLIUM COMPOUNDS from beryllium-containing minerals.—Deutsche Gold-und Silber-Scheideanstalt Vorm. Roessler. June 20, 1935. 457,315.

Specifications Accepted with Date of Application

METHOD OF CARRYING OUT CHEMICAL REACTIONS and extraction processes.—W. W. Groves (I. G. Farbenindustrie). Feb. 25, 1935. 457,552.

TREATING OIL-BEARING EDIBLE MATERIALS.—J. L. Fairrie. Feb. 26, 1935. 457,603.

CLARIFYING OF LIQUIDS and the thickening of sludge or pulp, especially with reference to the disposal of sewage.—Dorr-Oliver Co., Ltd., and R. C. Gibbs. March 1, 1935. 457,756.

MANUFACTURE OF DYESTUFF-SULPHONIC ACIDS.—W. W. Groves (I. G. Farbenindustrie). March 26, 1935. 457,555.

PROCESS OF OBTAINING THIO-BARBITURIC ACID COMPOUNDS.—A. F. Burgess (Abbott Laboratories). May 3, 1935. 457,762.

PRODUCTION OF INSOLUBLE AZO-DYESTUFFS on textile fibres.—J. S. Heaton. May 4, 1935. 457,763.

LIGHT FILTERS.—A. Carpmael (I. G. Farbenindustrie). May 30, 1935. 457,708.

PRODUCTION OF FOAMED SLAG from liquid slag.—E. B. Bjorkman. June 4, 1935. 457,774.

DEOXIDATION OF FERROUS METALS with cyclic utilisation and regeneration of slags.—Soc. D'Electro-Chimie, D'Electro-Metallurgie, et des Acieries Electriques D'Ugine. June 2, 1934. 457,856.

DEGASSERS.—B. E. A. Vigers, and Imperial Chemical Industries, Ltd. June 4, 1935. 457,777.

HIGH-VACUUM DISTILLATION APPARATUS.—B. E. A. Vigers, and Imperial Chemical Industries, Ltd. June 4, 1935. 457,778.

PRODUCTION OF PHYTOSTERIN PRODUCTS.—J. E. Pollak (Hansa-Muhle, A.-G.). June 4, 1935. 457,859.

PLASTIC MATERIALS containing rubber.—D. D. Pratt. June 4, 1935. 457,781.

OLIGO-DYNAMICALLY-ACTING GERMICIDAL PRODUCTS.—Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. June 2, 1934. 457,783.

OLIGO-DYNAMICALLY-ACTING GERMICI-AL PRODUCTS.—Deutsche Gold- Und Silber-Scheideanstalt Vorm. Roessler. June 2, 1934. 457,785.

MANUFACTURE OF COLOURING MATTERS.—M. Wyler, and Imperial Chemical Industries, Ltd. June 4, 1935. (Cognate Application, 29639/35.) 457,786.

MONOAZO DYESTUFFS.—A. H. Knight, and Imperial Chemical Industries, Ltd. June 4, 1935. 457,787.

MANUFACTURE AND PRODUCTION OF CONDENSATION PRODUCTS.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). June 5, 1935. 457,795.

MANUFACTURE AND PRODUCTION OF COLOUR LAKES.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). June 5, 1935. 457,796.

PRODUCTION OF FAST DYEINGS.—W. W. Groves (I. G. Farbenindustrie). June 5, 1935. 457,798.

USE OF SUBSTITUTED AMIDES of higher fatty acids.—Deutsche Hydrierwerke, A.-G. June 6, 1934. 457,810.

MANUFACTURE OF AZO-DYESTUFFS insoluble in water.—W. W. Groves (I. G. Farbenindustrie). June 7, 1935. 457,825.

MANUFACTURE OF AGRICULTURAL SPRAY MATERIALS.—E. I. du Pont de Nemours and Co. June 9, 1934. 457,828.

Applications for Patents

(November 19 to 25 inclusive.)

MANUFACTURE OF POLYMETHUNE ALDEHYDES.—W. W. Groves. 31705.

MANUFACTURE OF CYCLIC ACETALS OF FORMALDEHYDE.—W. W. Groves. 31816.

MANUFACTURE OF PAINT REMOVERS.—W. W. Groves. 31817.

DYEING TEXTILE FIBRES.—W. W. Groves. 31818.

MANUFACTURE OF AZO DYESTUFFS.—W. W. Groves. 32014.

PARCHMENTISING AND RENDERING TRANSLUSENT ARTIFICIAL SILK. W. W. Groves. 32133.

METHOD OF GELATINISING, ETC., POLYVINYL FORMALS.—W. W. Groves. 32137.

TREATMENT OF TEXTILE MATERIALS.—A. F. Guyler. 32288.

MATERIAL FOR PREVENTING SETTLEMENT OF WATER, ETC., UPON GLASS.—C. E. Heathfield. 32066.

MATERIAL FOR PREVENTING SETTLEMENT OF WATER, ETC., UPON GLASS.—W. Heathfield. 32066.

TANNING AGENTS.—I. G. Farbenindustrie and G. W. Johnson. 31725.

MANUFACTURE, ETC., OF ALPHA-BETA-UNSATURATED ACID AMIDES from ketone cyanhydrins.—I. G. Farbenindustrie. (Germany, Nov. 29, '35.) 31825.

MANUFACTURE, ETC., OF ALPHA-BETA-UNSATURATED ACID AMIDES from ketone cyanhydrins.—I. G. Farbenindustrie. (Germany, Dec. 21, '35.) (Cognate with 31825.) 31826.

MANUFACTURE OF 1:6-DINITRO-2-OXYNAPHTHALENE.—I. G. Farbenindustrie. (Germany, Nov. 22, '35.) 32013.

AZO DYESTUFFS.—I. G. Farbenindustrie, and W. W. Groves. 32134.

MANUFACTURE OF ACETALDEHYDE.—I. G. Farbenindustrie, and G. W. Johnson. 32298.

MANUFACTURE OF ISOCYANATES.—Imperial Chemical Industries, Ltd., H. S. Stratham, and H. A. Piggott. 32204.

MANUFACTURE OF ALKALI METAL CYANIDES.—Imperial Chemical Industries, Ltd. 32205.

TREATMENT OF TEXTILE MATERIALS.—Imperial Chemical Industries, Ltd., and H. A. Piggott. 32206.

MANUFACTURE OF RESINS.—Imperial Chemical Industries, Ltd. 32207.

MANUFACTURE OF BENZENE HEXACHLORIDE.—Imperial Chemical Industries. 32208.

COMPOSITION FOR PREVENTING CONDENSATION OF MOISTURE on glazed surfaces, etc.—L. Jacob, L. A. Jacob, and W. Warren. 32125.

PRODUCTION OF GAS UNDER PRESSURE.—H. Jänicke. (Germany, Dec. 2, '35.) 32269.

AZO DYESTUFFS.—G. W. Johnson (I. G. Farbenindustrie). 31724.

APPARATUS FOR REMOVAL OF READILY VOLATILE ACID CONSTITUENTS from liquids.—G. W. Johnson. 32017.

MANUFACTURE, ETC., OF AZO COMPOUNDS.—G. W. Johnson. 32018.
WATER-SOLUBLE CONDENSATION PRODUCTS.—G. W. Johnson. 32019.
MANUFACTURE, ETC., OF ALDEHYDES.—G. W. Johnson. (Dec. 18, '35.) 32161.
MEANS FOR REMOVING ASH from liquid substances containing carbon.—G. W. Johnson. 32293.
PROTECTION OF STEEL ARTICLES against chemical attack.—G. W. Johnson. 32294.
APPARATUS FOR TREATING LIQUIDS with gases.—Koppers Co. (United States, Nov. 21, '35.) 32029.
PREPARATION OF OESTRADIOL.—Laboratories Francais de Chimiotherapie, and G. Sanderson. 32115.
CONDITIONING OF WATER.—Michelin and Cie. (France, Dec. 13, '35.) 32184.
EXTRACTION OF DUST FROM GASES.—Mining Engineering Co., Ltd., and T. G. Nyborg. 31948.
MANUFACTURE OF OLEFINES.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, Nov. 29, '35.) 31849.
PROCESS FOR OBTAINING ALCOHOL, etc., by fermentation of liquids containing carbohydrate.—Naamlooze Vennootschap Internationale Suiker en Alcohol Co. Isaco. (Germany, Nov. 22, '35.) 32080.
SOFTENING OF WATER.—Rumford Chemical Works. (United States, May 15.) 32249.
MANUFACTURE OF TERTIARY ALCOHOLS of the cyclopentano polyhydro phenanthrene series.—Schering-Kahlbaum, A.-G. (France, Nov. 22, '35.) 32065.
PRODUCTION OF ALUMINA POWDER.—Siemens and Halske, A.-G. (Germany, Nov. 30, '35.) 32195.
MANUFACTURE OF GAS MASKS, ETC.—P. Stock. (Germany, Nov. 27, '35.) 32128.
PRODUCTION OF OZONE.—F. C. Sutton. 32308.
MANUFACTURE OF ETHERS.—W. J. Tennant (Henkel and Cie, Ges.). 32044.
MANUFACTURE OF ORGANIC MERCURY COMPOUNDS.—W. J. Tennant (E. Lilly and Co.). 32190.
DERIVATIVES OF BARBITURIC ACID.—A. A. Thornton (Chemische Fabriken, Dr. J. Wiernik and Co., A.-G.). (Nov. 1, '35.) 32132.
TESTING HARDNESS OF WATER.—United Water Softeners, Ltd. (United States, Nov. 22, '35.) 31950.
APPARATUS FOR DRYING SLURRY.—T. H. Varah. 31923.
MANUFACTURE OF PERCHLORETHYLENE.—Dr. A. Wacker Ges. für Elektrochemische Industrie Ges. (Germany, Dec. 12, '35.) 32012.
PRODUCTION OF FAST PRINTS on fibre.—A. G. Bloxam, and Soc. of Chemical Industry in Basle. 32747.
EXTRACTING SUPRARENAL CORTEX.—A. G. Bloxam (Soc. of Chemical Industry in Basle). 32524.
MANUFACTURE OF ARTIFICIAL SILK.—British Enka Artificial Silk Co., Ltd., and S. B. R. Schueren. 32427.
APPARATUS FOR MANUFACTURE OF GAS.—C. F. Broadhead. (Australia, Dec. 21, '35.) 32970.
PLASTIC COMPOSITION.—J. Cairns. 32622.
PREPARATION OF SECONDARY AROMATIC AMINES.—Calco Chemical Co., Inc. (United States, Dec. 6, '35.) 32445.
SEPARATION OF LIQUIDS, ETC.—M. Calm. 32949.
MANUFACTURE OF WATER-SOLUBLE AZO DYESTUFFS.—A. Carpmael. (I. G. Farbenindustrie). 32839.
GAS-DISPERSING GRENADES, ETC.—Civil Protection, Ltd. (Federal Laboratories, Inc.). 32780, 32781, 32782, 32783, 32784, 32785.
DISTILLATION OF GLYCERINE.—Colgate-Palmolive-Peet Co. (United States, Dec. 23, '35.) 32969.
CATALYSTS FOR DEODORISING EXHAUST GASES, ETC.—Degea, A.-G. (Auerges). (Germany, March 16.) 32433.
MANUFACTURE OF AZO-DYESTUFFS, ETC.—E. I. du Pont de Nemours and Co., and A. Siegel. 32938.
SEPARATION OF GRANULAR MATERIALS.—C. W. Gardiner. 33066.
DIELECTRIC LIQUIDS.—E. I. du Pont de Nemours and Co. (United States, Dec. 5, '35.) 32992.
APPARATUS FOR GAS ANALYSIS.—J. A. Gardner. 32658.
MANUFACTURE, ETC. OF CYANINE DYESTUFFS, ETC.—B. Gaspar. 32504.
PRODUCTION OF CELLULOSE ESTERS.—N. V. Gevaert Photo Producten. (Austria, Dec. 5, '35.) 32775.
PRODUCTION OF CELLULOSE ESTERS.—N. V. Gevaert Photo Producten. (Austria, Dec. 3, '35.) 32776.
MANUFACTURE OF CYCLIC ACETALS of formaldehyde.—W. W. Groves (I. G. Farbenindustrie.) 32525.
PRODUCTION OF DISPERSIONS OF SOLID CARBONACEOUS MATTER IN OIL.—W. W. Groves (I. G. Farbenindustrie). 32549.
PROCESS OF IMPARTING HYDROPHOBIC PROPERTIES to textile fibres, etc.—W. W. Groves (I. G. Farbenindustrie). 32637.
REVERSAL DEVELOPMENT OF LIGHT-SENSITIVE SILVER HALIDE EMULSIONS.—W. W. Groves (I. G. Farbenindustrie). 32745.
AIR-CONDITIONING APPARATUS.—Hanovia Chemical & Manufacturing Co. (United States, Nov. 30, '35.) 32391.
MANUFACTURE, ETC., OF COMPOUNDS for production of sensitive layers for diazo-type process.—Harper and Tunstall, Ltd., and O. W. Powell. 32922.
MANUFACTURE, ETC., OF VALUABLE HYDROCARBONS, ETC.—I. G. Farbenindustrie. (Germany, Nov. 30, '35.) 32419.
ACETYLENE GENERATORS.—I. G. Farbenindustrie. (Germany, Nov. 29, '35). 32528.
MANUFACTURE OF CONDENSATION PRODUCTS of the diphenylamine series.—I. G. Farbenindustrie. (Germany, Nov. 28, '35.) 32573.

Chemical and Allied Stocks and Shares

THE stock and share markets have been more active since the beginning of the new Stock Exchange account on Monday and the general tendency has been to higher prices. Distillers were prominent on increasing anticipations in the market that either a good increase in dividend or a share bonus will be forthcoming in 1937, and as compared with a week ago there has been an advance from 115s. 3d. to 125s. 3d. Several other shares of companies identified with the chemical and kindred trades were also influenced by talk of possible bonus distributions. Triplex Safety Glass have risen strongly from 144s. 4½d. to 157 6d., there being anticipations that in this case the bonus may be made early in the new year. Pinchin Johnson at 53s. 3d. have also made a higher price on continued hopes that a special payment of some kind may be distributed; it has been stated officially that reserves and undivided profits are in excess of requirements. B. Laporte were again steady at 127s. 6d., and continued to be held firmly on the possibility that another scrip bonus may be distributed in addition to the final dividend.

Imperial Chemical have made the higher price of 42s. 6d. There is now a growing disposition in the market to look for a moderate increase over the 8 per cent. dividend paid for 1935. It is pointed out that there are several favourable developments in the international trade situation, such as better economic conditions in the Argentine, and that particularly as the upward movement in profits is probably being continued, the directors may decide to adopt a rather more liberal dividend policy. Salt Union were again steady at 44s. For some years this company has limited its dividend to 9 per cent. and an increased payment may also be possible in this case, although it is generally realised that export trade is also an important factor in the position. International Combustion responded strongly to the raising of the distribution for the year from 20 per cent. to 30 per cent. and Cannon Iron Foundries were good on the larger dividend of 15 per cent.

Boots Pure Drug have moved up from 57s. 9d. to 58s. 6d. Sangers remained steady on hopes of a larger interim dividend and Timothy Whites and Taylors were higher at 34s. 6d., while South African Druggists were active on favourable estimates of the final dividend. United Molasses were a few pence higher at 24s. 7½d. in advance of the annual meeting. Low Temperature Carbonisation were active on the past year's results.

British Glues and Chemicals and British Industrial Plastics were steady and Erinoid were reported to be more active on the apparently attractive yield offered by the shares. General Refractories 10s. shares were firmer at 31s. 3d. The market is anticipating that despite the larger capital ranking, there are good prospects of the dividend at least being maintained at 15 per cent. The 5s. shares of International Diatomite, which were issued recently, have been steady and are 6s. 10½d. at the time of writing, and the 4½ per cent. preference shares of National Fertilisers remained at 20s. 6d. Imperial Smelting made the rather higher price of 19s. 9d. in response to the rise in the price of spelter, which, if maintained, would probably be a good development for the company. Fison, Packard and Prentice were again 42s. 6d. Goodlass Wall and Lead Industries were moderately lower at 14s. 9d., but the price was not apparently tested by much business. United Glass Bottle and Canning Town Glass were firm on continued hopes of larger dividends.

Associated Portland Cement made a higher price, largely owing to attention drawn to the possibility of expansion in the demand for cement arsing from the important road construction schemes. Blythe Colour Works were steady on favourable estimates of the final dividend.

Dorman Long did not keep best prices but continued to receive considerable attention on the belief that the issue of shares on bonus terms, referred to at the recent meeting, will probably be made at the end of the month or early in the new year. Consett Iron, Richard Thomas and most other leading iron, steel and allied shares have shown further recovery in price.

Leading oil shares were more active, partly on attention drawn to the growing belief that higher oil prices are likely to be established in 1937. The 1s. deferred shares of Petroleum Storage and Finance remained active in response to current dividend estimates.

Weekly Prices of British Chemical Products

THERE are no price changes to report in the London chemical markets this week. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

MANCHESTER.—Trading conditions generally on the Manchester chemical market during the past week have been moderately active. Additional contract business has been booked and, on the whole, traders state that the total of forward buying has compared favourably with what it was at about this time last year. It is expected that the next two weeks will witness the customary quiet spell. In addition to the actual holiday stoppages at the chemical-consuming establishments it is anticipated that deliveries will be affected by stocktaking operations in a number of instances. In the meantime, however, there is relatively little of which to complain regarding the call for supplies both of heavy and light descriptions of chemicals. Prices are generally steady. Among the by-products, solvent naphtha and the toluols and xylols, in particular, are well held and in fair demand.

GLASGOW.—Business in general chemicals has been rather quiet during the week, both for home trade and export. Prices, however, continue firm at about previous figures, several articles being rather dearer. Red and white lead prices have been increased £1 per ton, on account of the advance in the price of the metal. Conditions on the market for coal tar products have been quieter this week and actual buying somewhat limited. Inquiries for the lighter products are numerous, however, and values well maintained. Fresh business has been booked in the American grade of cresylic acid and several spot lots of pale and dark 97/99% have been sold. Creosote continues steady. An increased demand for supplies of pyridine is giving to prices of these fractions an upward tendency. Apart from small consignments there is little movement of pitch. Quotations for this product now range wider from 28s. 6d. to 35s. per ton according to quality.

General Chemicals

ACETONE.—£62 to £65 per ton; SCOTLAND: £64 to £65 ex wharf, according to quantity.

ACID, ACETIC.—Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £32 5s. to £34 5s.; tech., 40%, £16 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £32 5s.; tech., 80%, £30 5s., d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ACID, BORIC.—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. B.P. cryst., £36; B.P. powder, £37. SCOTLAND: Crystals, in 1 cwt. bags, £28; powdered, in 1 cwt. bags, £29.

ACID, CHROMIC.—9½d. per lb., less 2½%; d/d U.K.

ACID, CITRIC.—1s. per lb. MANCHESTER: 11¾d. SCOTLAND: B.P. crystals, 1s. per lb., less 5%.

ACID, CRESYLIC.—97/99%, 3s. 2d. to 3s. 3d. per gal.; pale, 98%, 3s. 1d. to 3s. 2d.; dark, 2s. 6d. to 2s. 7d.; 99/100%, refined, 3s. 7d. to 3s. 9d. per gal. MANCHESTER: 99/100%, pale, 3s. 5d.

ACID, FORMIC.—85%, in carboys, ton lots, £42 to £47 per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50: pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works. SCOTLAND: 80°, £24 ex station full truck loads.

ACID, OXALIC.—£48 15s. to £57 10s. per ton, according to packages and position. SCOTLAND: £2 9s. 6d. per cwt. in casks. MANCHESTER: £50 to £55 per ton ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. SCOTLAND: 11¾d. less 5%. MANCHESTER: 11¾d. to 1s. per lb.

ALUM.—SCOTLAND: Ground, £10 2s. 6d. per ton; lump, £9 12s. 6d.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—LONDON: Fine white crystals, £18 to £19. (See also Salammoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM SULPHATE.—Neutral quality, 20.6% nitrogen, £7 5s. per ton.

ANTIMONY OXIDE.—SCOTLAND: £61 to £65 per ton, c.i.f. U.K. ports.

ANTIMONY SULPHIDE.—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

ARSENIC.—LONDON: £13 10s. per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £17 ex store. MANCHESTER: White powdered Cornish £17 10s. ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BARYTES.—£6 to £7 10s. per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.a. London.

BLEACHING POWDER.—Spot, 35/37%. £8 15s. per ton in casks, special terms for contracts. SCOTLAND: £9.

BORAX COMMERCIAL.—Granulated, £14 10s. per ton; crystal £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots. SCOTLAND: Granulated, £14 10s. per ton in 1 cwt. bags, carriage paid.

CADMIUM SULPHIDE.—4s. 3d. to 4s. 5d. per lb.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums. SCOTLAND: 70/75% solid, £5 10s. per ton net ex store.

CARBON BISULPHIDE.—£31 to £33 per ton, drums extra.

CARBON BLACK.—3¾d. to 4¾d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—SCOTLAND: £41 to £43 per ton, drums extra.

CHROMIUM OXIDE.—10½d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—£3 19s. per cwt. less 2½%. LONDON: £3 17s. per cwt. SCOTLAND: £3 19s. 6d. net.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £24 10s. per ton. SCOTLAND: 40% £25 to £28 ex store.

IODINE.—Resublimed B.P., 5s. 1d. per lb.

LAMPBLACK.—£22 to £23 per ton.

LEAD ACETATE.—LONDON: White, £33 15s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £34 to £35; brown, £1 per ton less. MANCHESTER: White, £35 10s., brown, £34 10s.

LEAD NITRATE.—£32 10s. to £34 10s. per ton.

LEAD, RED.—SCOTLAND: £36 per ton less 2½%, carriage paid, for 2-ton lots.

LEAD, WHITE.—SCOTLAND: £41 per ton, carriage paid. LONDON: £41.

LITHOPONE.—30%, £16 to £16 5s. per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 per ton.

MAGNESIUM SULPHATE.—Commercial, £5 per ton, ex wharf.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

PHENOL.—6¾d. to 7¼d. per lb.

POTASH, CAUSTIC.—LONDON: £42 per ton. MANCHESTER: £39

POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 4¼d. per lb. MANCHESTER: £38 per ton.

POTASSIUM CHROMATE.—6¼d. per lb. d/d U.K.

POTASSIUM IODIDE.—B.P. 4s. 3d. per lb.

POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 8¼d. per lb. SCOTLAND: B.P. Crystals, 8¾d. MANCHESTER: B.P. 10¾d. to 11½d.

POTASSIUM PRUSSIATE.—LONDON: Yellow, 7¼d. to 8d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6¾d.

SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels. SCOTLAND: Large crystals, in casks, £36.

SODA ASH.—58% spot, £5 12s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £17 15s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: £12 10s. per ton in 1 cwt. kegs, £10 15s. per ton in 2 cwt. bags. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. SCOTLAND: 4d., less 5% carriage paid.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£29 per ton. SCOTLAND: £1 10s. per cwt.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10; photographic, £14 10s.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9¼d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSIATE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 4½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 10s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 2s. 6d. to £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.

SODIUM SULPHITE.—Pea crystals, spot, £13 5s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHATE OF COPPER.—MANCHESTER: £17 10s. to £18 per ton f.o.b. SCOTLAND: £17 15s. per ton less 5%.

SULPHUR.—£9 to £9 5s. per ton. SCOTLAND: £8 to £9.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 5s. 1d. per lb. in 1-cwt. lots.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Neutral quality, basis 20.6 per cent. nitrogen, delivered in 6-ton lots to farmer's nearest station, December, £7 0s. 6d. per ton; January, 1937, £7 2s. per ton; February, £7 3s. 6d. per ton; March to June, £7 5s. per ton.

CALCIUM CYANAMIDE.—December, £7 per ton; January, 1937, £7 1s. 3d. per ton; February, £7 3s. 6d. per ton; March, £7 3s. 9d. per ton; April to June, £7 5s. per ton, carriage paid to any railway station in Great Britain in lots of four tons and over.

NITRO-CHALK.—£7 5s. per ton for delivery to end of June, 1937.

NITRATE OF SODA.—£7 12s. 6d. per ton for delivery up to end of June, 1937.

CONCENTRATED COMPLETE FERTILISERS.—£10 12s. to £11 1s. per ton for delivery up to end of June, 1937, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton for delivery up to end of June, 1937, delivered in 6-ton lots to farmer's nearest station.

Coal Tar Products

ACID, CRESYLIC.—97/99%, 3s. 2d. to 3s. 3d. per gal.; 99/100%, 3s. 6d. to 4s. per gal., according to specification; pale 99%, 3s. 4d. to 3s. 5d.; dark, 2s. 9d. to 2s. 10d. GLASGOW: Pale, 99/100%, 3s. to 3s. 6d. per gal.; pale, 97/99%, 2s. 6d. to 2s. 9d.; dark, 97/99%, 2s. 5d. to 2s. 8d.; high boiling acids, 1s. 8d. to 2s.; American specification, 2s. 9d. to 3s.

ACID, CARBOLIC.—Crystals, 6¾d. to 7¼d. per lb.; crude, 60's, 2s. 7d. to 2s. 9d. per gal. MANCHESTER: Crystals, 6¾d. to 7d. per lb.; crude, 2s. 8d. per gal. GLASGOW: Crude, 60's, 2s. 6d. to 2s. 9d. per gal.; distilled, 60's, 2s. 9d. to 3s. 3d.

BENZOL.—At works, crude, 8¼d. to 9d. per gal.; standard motor 1s. 2d. to 1s. 2¼d.; 90%, 1s. 3d. to 1s. 3¼d.; pure, 1s. 7d. to 1s. 7½d. LONDON: Motor, 1s. 3¼d. GLASGOW: Crude, 9d. to 10d. per gal.; motor, 1s. 1½d. to 1s. 3d.

CREOSOTE.—B.S.I. Specification standard, 5¾d. to 6d. per gal. f.o.r. Home, 3¾d. d/d. LONDON: 4¼d. f.o.r. North: 5d. London. MANCHESTER: 5d. to 5½d. GLASGOW: B.S.I. Specification 5¼d. to 5½d. per gal.; washed oil, 4¼d. to 4¾d.; lower sp. gr. oils, 4¾d. to 5d.

NAPHTHA.—Solvent, 90/160%, 1s. 5¼d. to 1s. 6½d. per gal.; 95/160%, 1s. 7d.; 90%, 1s. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. GLASGOW. Crude, 5½d. to 6d. per gal.; 90% 160, 1s. 4½d. to 1s. 5½d.; 90% 190, 1s. to 1s. 1d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £12 to £13 per ton; purified crystals, £20 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 to £5 10s. per ton; crystals, £27 to £27 10s. GLASGOW: Fire lighter, crude, £7 to £7 10s. per ton (bags free).

PYRIDINE.—90/140%, 8s. to 9s. 6d. per gal.; 90/180, 2s. 3d. to 2s. 6d. GLASGOW: 90% 140, 7s. to 8s. per gal.; 90% 160, 5s. to 6s.; 90% 180, 2s. 6d.

TOLUOL.—90%, 2s. per gal.; pure, 2s. 5d. GLASGOW: 90%, 120, 1s. 10d. to 1s. 11d. per gal.

PITCH.—Medium, soft, 34s. per ton, in bulk at makers' works. MANCHESTER: 32s. 6d. to 35s. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 28s. 6d. to 35s. per ton; in bulk for home trade, 32s. 6d.

XYLOL.—Commercial, 2s. 1d. per gal.; pure, 2s. 3d. GLASGOW: Commercial, 1s. 11d. to 2s. per gal.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8 10s. to £9 per ton; grey, £10 10s. to £11. Liquor, brown, 30° Tw., 6d. to 8d. per gal. MANCHESTER: Brown, £9 10s.; grey, £11 10s.

CHARCOAL.—£5 5s. to £10 per ton, according to grade and locality.

METHYL ACETONE.—40-50%, £45 to £48 per ton.

WOOD CREOSOTE.—Unrefined 6d. to 1s. 6d. per gal., according to boiling range.

WOOD, NAPHTHA, MISCIBLE.—2s. 9d. to 3s. 3d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.

WOOD TAR.—£2 to £3 per ton.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex toluol).—1s. 9¼d. per lb. d/d buyer's works.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4¼d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZIDINE, HCl.—2s. 5d. per lb., 100% as base, in casks.

o-CRESOL 30/31° C.—6¼d. to 7¼d. per lb. in 1-ton lots.

p-CRESOL 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

DICHLORANILINE.—1s. 11¼d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROBENZENE.—8d. per lb.

DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10¼d.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.

α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works

β-NAPHTHOL.—In bags, £88 15s. per ton; in casks, £89 15s.

α-NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0¼d.

β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works in casks.

o-NITRANILINE.—3s. 11d. per lb.

m-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

Latest Oil Prices

LONDON, Dec. 16.—LINSEED OIL was easier. Spot, £30 (small quantities); Jan. and Jan.-April, £27 7s. 6d.; May-Aug., £27 15s.; Sept.-Dec., £28 5s., naked. SOYA BEAN OIL was firm. Oriental (bulk), spot, ex tank, Rotterdam, £32. RAPE OIL was firm. Crude, extracted, £35 10s.; technical refined, £36 10s., naked, ex wharf. COTTON OIL was dearer. Egyptian, crude, £32; refined common edible, £35; deodorised, £37, naked, ex mill (small lots £1 10s. extra). TURPENTINE was steady. American, spot, 43s. per cwt.

HULL.—LINSEED OIL.—Spot, quoted £28 5s. per ton; Dec. and Jan.-April, £27 10s.; May-Aug., £27 15s.; Sept.-Dec., £28 5s. COTTON OIL.—Egyptian, crude, spot, £32 10s. per ton; edible, refined, spot, £35; technical, spot, £35; deorodsied, £37, naked. PALM KERNEL OIL.—Crude, f.m.q., spot, £36 per ton, naked. GROUNDNUT OIL.—Extracted, spot, £35 10s. per ton; deodorised, £38 10s. RAPE OIL.—Extracted, spot, £34 10s. per ton; refined, £35 10s. SOYA OIL.—Extracted, spot, £33 10s. per ton; deodorised, £35 10s. COD OIL.—F.o.r. or f.a.s., 27s. per cwt., in barrels. CASTOR OIL.—Pharmaceutical, 45s. per cwt.; first, 40s.; second, 38s. TURPENTINE, American, spot, 44s. 9d. per cwt.

Company News

British Drug Houses.—The usual quarterly of 1¼ per cent. on preference shares is payable on December 31.

United Indigo and Chemical.—The dividend on 5 per cent. preference shares for six months ending December 31 is announced.

Coal and Allied Industries.—An informal meeting of shareholders on December 14 approved the board's proposals for the issue of £220,000 5 per cent. convertible non-cumulative income debenture stock.

Milton Proprietary.—The report for the year to September 30 last shows a profit £47,564, against £47,250. The final ordinary dividend is 17½ per cent., making 25 per cent. (same); £81,050 is carried forward.

Low Temperature Carbonisation, Ltd.—Profit on trading, with interest and dividends, for the year ending October 31, 1936, amounts to £97,686, as compared with £78,480 last year. The directors recommend the payment of a dividend of 6 per cent., less tax. This will absorb £58,331, leaving £11,997 to be carried forward.

Yorkshire Dyeware and Chemical Co.—This company has doubled its interim dividend at 1s. per share or 5 per cent. Last year's interim of 2½ per cent., was followed by a final of 7½ per cent., and a bonus of 5 per cent., which maintained the total distribution for the year at 15 per cent., less tax. The company, of which Mr. C. S. Bedford is chairman, has an authorised and issued capital of £200,000.

East India Distilleries and Sugar Factories.—Accounts for year ended September 30, 1936, show a net profit of £43,093 (£26,011); add £5,939 brought forward, making £49,032. A dividend of 10 per cent. (same) on ordinary shares, payable, less tax, on January 1, has been declared. To general reserve £15,000, to tax reserve £4,000, forward £8,032. Meeting, 107 Old Broad Street, E.C., December 23, at 12 noon.

International Combustion.—A final dividend of 12½ per cent., accompanied by a bonus of 10 per cent., is recommended. This makes a total distribution for the year ended September 30 last of 30 per cent., less tax, compared with 20 per cent. for the previous year, when no bonus was paid. It is proposed to repeat the allocation to reserve at £50,000. The company, of which Mr. G. R. T. Taylor is chairman, has an authorised and issued capital of £501,698 in £150,000 6 per cent. cumulative preference shares and £351,698 ordinary shares.

Zinc Corporation.—The second half of the fixed cumulative dividend on the preference shares in respect of the year ending December 31, 1936, and an interim participating dividend of 2s. 6d. per share, or 25 per cent., on the preference and ordinary shares for the same period has been declared. Both dividends will be paid, less tax, on January 1, 1937. The holders of the £245,692 issued preference shares are entitled to a cumulative dividend of 20 per cent., and to share ratably with the holders of the £326,569 issued ordinary capital in surplus profits. Last year the total participating distribution on both classes was 4s. 6d. per share, or 45 per cent., less tax, being made up of an interim of 20 per cent. and a final of 25 per cent.

Sulphide Corporation.—The accounts for the twelve months ended June 30 last shows that the balance of profit from trading has been barely maintained at £82,297 against £88,212. Interest on investments brought £7,471 and there was a profit on sale of investments of £5,584. Adding interest and discount and sundry differences on exchange there is a total of £99,984. London and Melbourne expenses absorbed £6,468, and £2,447 was required for directors' fees and law costs, leaving a net balance of £91,068—a fall of £1,279. After appropriating £8,000 for contingencies reserve and meeting the year's preference dividend, the directors, as already known, have doubled the ordinary dividend for the year at 5 per cent. This leaves a balance of £568 to be taken forward. Meeting, Winchester House, E.C.2, December 18, at 12 noon.

British Tar Products.—The report for the year to September 30, 1936, states that investments, which have been increased from £136,747 to £148,768, with market value on September 30 last of £148,044, have since the close of the company's year further appreciated their value at this date being £150,000. Net profits for the year, after deducting £10,618 for depreciation, amount to £56,904, against £55,277; adding amount brought forward £4,041, makes £60,945. The interim of 6¼ per cent. absorbed £15,802, and income-tax £10,809, leaving £34,333. Final dividend on preferred ordinary and ordinary shares of 3¾ per cent., less tax, making 10 per cent., less tax, for year (same), bonus of 5 per cent. (same) on preferred ordinary and ordinary shares, and management commission takes £23,905; off goodwill and contracts £6,000 (£5,000); forward, £4,428.

Books Received

Intermediate Chemistry. By T. M. Lowry and A. C. Cavell. London: Macmillan and Co., Ltd. Pp. 876. 12s. 6d.

New Companies Registered

Stableford All-Metal Screens, Ltd.—Registered November 30. Nominal capital, £10,000. To acquire patents and brevets d'invention, to manufacture and deal in machinery, chemical plate implements and rolling stock, etc. Subscribers: John P. Magee and A. L. Howard.

Starkey Products Co., Ltd.—Registered November 28. Nominal capital £1,000. Wholesale and retail chemical manufacturers and engineers, analytical and consulting chemists, manufacturers of paints, oils, varnishes, dye wares, disinfectants, coal and oil products and chemicals, distillers, manufacturing general perfumers, soap makers, tobacconists, etc. Subscribers: Thomas W. S. Robinon, 66 Drayton Gardens, N.21, and L. S. Yoxall.

Crosby's Warehouse, Ltd., 73 Newborough Street, Scarborough. Registered November 14. Nominal capital £100. Drysalters, oil and colour men, paint and colour grinders, manufacturers, retailers, importers and exporters of pharmaceutical, medicinal, chemical, veterinary, industrial and other preparations, etc. Directors: Wm. R. Eyre, Mark D. Hick, Henry M. Eyre.

J. V. Rushton, Ltd.—Registered November 10. Nominal capital £1,000. To acquire rights and interest of J. V. Rushton in the formula or secret process relating to anodic oxidation, designated by him the Ace process and the Anodic process, and to carry on the business of anodisers, metal finishers, depositors, sprayers, and platers, electro platers, oxidisers, bronzers, lacquerers, enamellers, varnishers, polishers and welders, manufacturers and workers of and dealers in chemicals, etc. Subscribers: John V. Rushton, 134 Mount Road, Penn, Wolverhampton, and Mrs. Florence Rushton.

The Empire Exhibition Scotland, 1938., 19 Blythswood Square, Glasgow, C.2.—Registered November 18, as a company limited by guarantee, without share capital, and having an unlimited number of members. The word "Limited" is omitted from title by licence of the Board of Trade. To promote and develop the industrial, commercial, economic and cultural interests of Scotland and with a view thereto to prepare for, organise, inaugurate and conduct during 1938 a public exhibition. Directors include: The Earl of Elgin and Kincardine, Sir Alexander S. Bilsland, Sir Robert Bruce, the Earl of Stair, Sir James Lithgow, Sir Henry S. Keith, Sir William A. C. Goodchild, Sir Alexander M. McEwen, and Sir Alexander B. Swan.

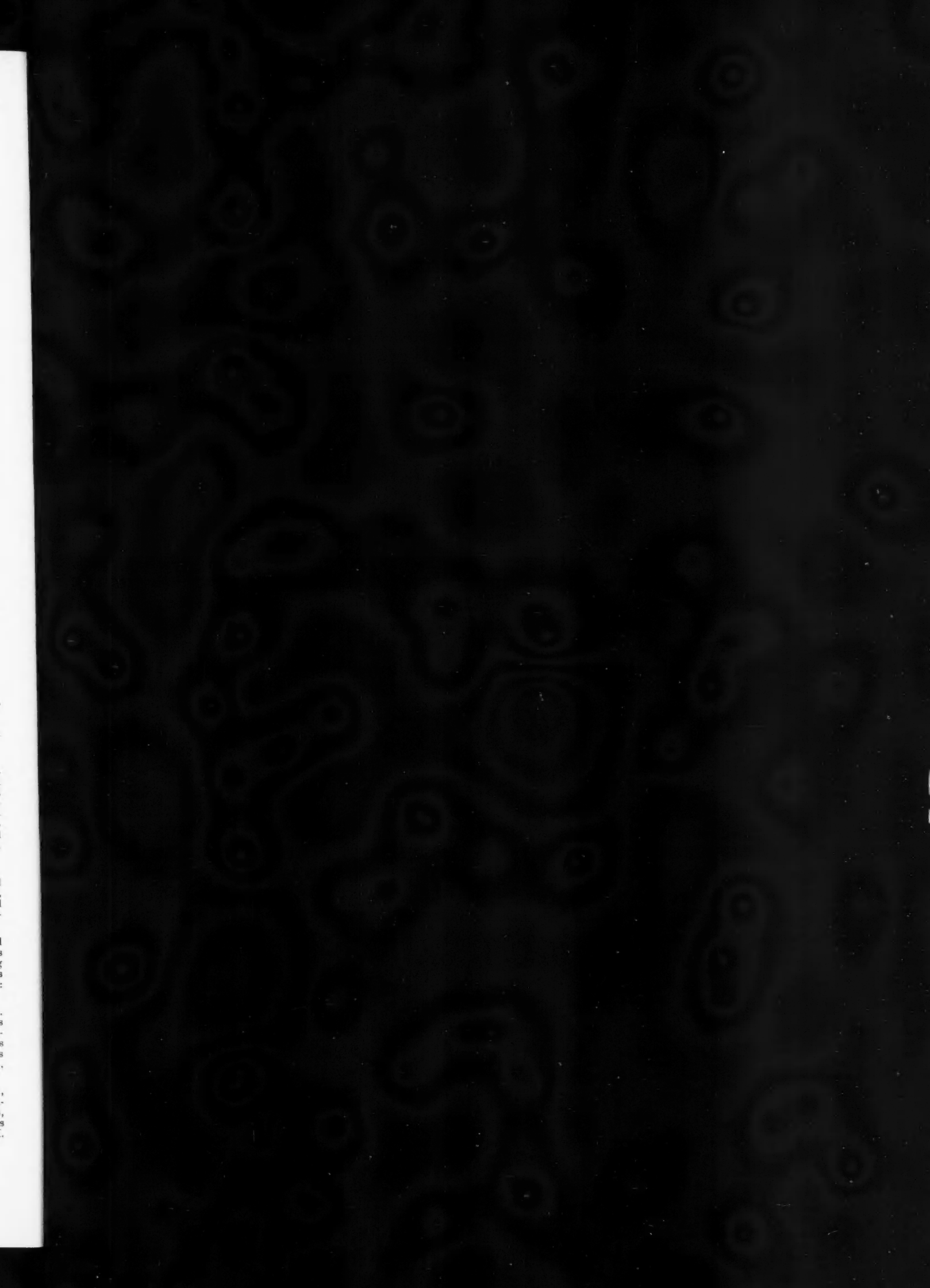
Thomas Appleton and Company, Ltd.—Registered December 7.—Nominal capital £100. To adopt an agreement with the Bleachers' Association, Ltd., and to carry on the business of bleachers, dyers, finishers, dressers and chemical manufacturers, etc. Subscribers: W. Clare Lees, Etherow House, Hollingworth, near Manchester, and G. C. Deakin.

International Colour Co., Ltd., Tredegar House, Milton Street, E.C.—Registered November 18. Nominal capital £500. Manufacturers of and dealers in chemicals, gases, drugs, colours, pigments, dyes, varnishes and other chemical preparations, chemical engineers, dyers, makers of chemical plant and materials, etc. Directors: Bela Deutsch, R. E. Townsend, and S. C. Sloggett.

Newark Chemical Laboratories (London), Ltd., 4 Gresse Buildings, Stephen Street, W.1.—Registered November 21. Nominal capital, £2,000. To acquire the business of Newark Chemical Laboratories now carried on by Fdk. Rossi at 1-3 Gresse Buildings, Stephen Street, W.1, and to carry on the business of distributors, vendors and factors of, agents for and dealers in Newmark's Grapex Tannin and manufacturers of other oenological chemicals, etc. Directors: Abraham Newmark, F. Rossi, P. Gallo and R. Barker.

Fleet Stampings, Ltd., 134 High Street, Borough, S.E.1.—Registered December 3. Nominal capital £500. Manufacturers of and dealers in gas decontaminating appliances, apparatus and supplies, including masks and respirators, goggles, curtains, screens, filters and all other appliances and accessories concerned with fire and gas protection, etc. Directors: H. J. McHugh and J. Rogers.

Gas Proofing Co., Ltd., 83 Fore Street, E.C.2.—Registered December 3. Nominal capital £1,000. Engineers, manufacturers of and dealers in appliances and substances used for rendering buildings or parts thereof proof against the entry of noxious gases and for the purifying and sterilisation of the air. Subscribers: Alban C. H. Barchand and P. C. Andrews.

Gospo Ltd., 62 London Wall, E.C.2.—Registered December 3. Nominal capital £24,000. To acquire the goodwill of the business carried on by Gospo, Ltd., and to carry on the business of manufacturers of soaps, powders and cleansing materials, manufacturers and refiners of and dealers in all kinds of chemical and substances used in the manufacture thereof, etc. Directors: Sidney Allen, J. F. C. Dugdale and H. W. Whitmee.

Herring Giles, Ltd., Tower Works, Marshgate Lane, Stratford, E.15.—Registered December 3. Nominal capital £14,000. Manufacturers, producers, treaters and sellers of and dealers in isinglass, sugar, glucose, caramel, invert brewing and other sugars, chemicals and chemical products, etc. Directors are: Cecil A. Griffin, C. H. Griffin and G. A. Griffin.